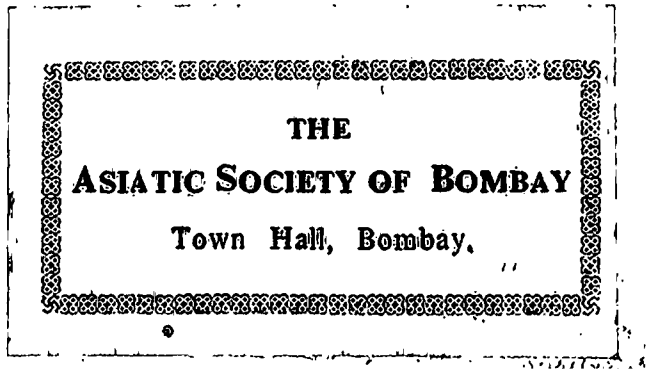
00033467



Digitized with financial assistance from the
Government of Maharashtra
on 02 January, 2016

A

DICTIONARY

OF

CHEMISTRY,

AND OF

MINERALOGY,

AS CONNECTED WITH IT,

IN WHICH IS ATTEMPTED

A COMPLETE LIST OF THE NAMES OF SUBSTANCES, ACCORDING TO THE PRESENT AS WELL AS FORMER SYSTEMS;

WITH AN

33467
a.

INTRODUCTION,

POINTING OUT THE ORDER IN WHICH THE CHIEF PARTS OF THE WORK MAY BE PERUSED, SO AS TO CONSTITUTE A

REGULAR COURSE OF *CHEMISTRY*;

AND

A VOCABULARY,

IN WHICH THE APPARATUS AND PROCESSES MADE USE OF ARE BRIEFLY DESCRIBED.

COPIOUS NOTES, &c. &c.

C C. k.

By WILLIAM CAMPBELL OTTLEY.

tt. k. 3

LONDON:
JOHN MURRAY, ALBEMARLE STREET.

1823.

540.3
Ott/Dic
33467

549.03

00033467

INTRODUCTION.

THE numerous and important discoveries made by Sir H. Davy and other philosophers during the last twenty years, have gradually occasioned an entire change in the theory of Chemistry; and it has from time to time been found expedient to make such alterations in the names of different substances as should render them most expressive of their newly discovered properties, and of the prevailing theory of the day with regard to their composition. Had these changes of nomenclature been made once for all, the embarrassment occasioned by them to the student would have been comparatively trifling; but, it is well known, that they have been frequent, and that in the names of many substances no less than a dozen alterations have taken place in perhaps the same number of years; hence, some of the best works on Chemistry of the eighteenth century are now become nearly incomprehensible; and even more recent publications often present serious difficulties to the student.

A work, therefore, like the present, appeared to the author to be a desideratum, and, as he found several of his chemical friends to be of the same opinion, he was induced to undertake the Dictionary now offered to the public; wherein, as far as he has been able, he has given a list of all the various appellations by which the several substances have at different periods been known, together with the original causes of their adoption, and the grounds upon which, from time to time, they have been since changed; always referring the reader, from the appellations now obsolete, to those of the most approved nomenclature of the present day. So far the work is new, and he has good reason to hope may prove useful.

It may be proper to state, that Sir H. Davy's *theories*, particularly with regard to the hydrogen acids and their compounds, have been *strictly adhered to*; and as, by persons having but a slight knowledge of chemistry, these are as yet but imperfectly understood, a comparative view of the old and new theories is in most cases given; thus shewing the reasons for changes made in the nomenclature; by which means those who have studied chemistry at an early period may, without difficulty, be enabled to resume their researches, now that the science is in a more mature state.

In conjunction with the above object, the author has endeavoured to combine the other requisites

of an elementary book; having inserted every thing which he believes essential to a knowledge of the principles of chemistry; so that by a careful perusal of the different parts of the work, in the order which will be presently laid down, a person hitherto unacquainted with the subject, may be enabled to instruct himself concerning it.

A short Vocabulary precedes the dictionary, in which the *technical terms*, together with the *apparatus* and *processes* made use of in chemistry, are briefly explained and described.

The *Notes*, which are placed at the end of the volume, contain various *analyses*, useful *tables*, &c. —some of them original;—and they are referred to in all those parts of the work which they are intended to illustrate.

Persons requiring elementary instruction in Chemistry are recommended to peruse the principal articles of the work in the following order: *Combination, Chemical — Attraction, Elective* — (These two articles will be found in the vocabulary)—*Bodies, Simple — Bodies, Compound—Caloric—Light —Fluid, Electric —Oxygen, Oxides,* and *Gas Oxygen—Air, Atmospheric—Chlorine,* and its adjoining compounds—*Chlorides—Iodine —Hydrogen—Water—Carbon,* and compounds—*Gas, Carburetted Hydrogen—Sulphur*, and compounds—*Gas, Sulphuretted Hydrogen—Phospho-*

rus, and compounds—*Gas*, *Phosphuretted Hydrogen*—*Gas*, *Nitrogen*—*Nitrogen*, and compounds—*Acids*—each different acid separately—*Salts*—*Metals*—each metal separately with its compounds—*Alkalies*—*Potass*, and compounds—*Soda* and compounds—*Lithia*—*Ammonia*, and compounds—*Earths*—each earth separately, with its compounds—*Substances*, *animal*—*Substances*, *vegetable*—*Principles*, &c. &c.

A

VOCABULARY,

IN WHICH TECHNICAL TERMS, TOGETHER WITH THE APPARATUS AND PROCESSES MADE USE OF IN CHEMISTRY, ARE BRIEFLY EXPLAINED AND DESCRIBED.

A.

ABSORB. To suck in. Whenever a solid body combines with one that is fluid, and the compound formed is solid; the solid is said to have absorbed the fluid. The same rule holds good with regard to aëriform bodies and liquids; thus, water absorbs carbonic acid gas.

ABSTRACT. To draw off or take from. This word is generally used to signify drawing off by distillation. *See* DISTIL.

ACIDIFY. To convert into an acid.

ADAPTER, OR ADOPTER. A sort of long glass tube, which is often luted to the neck of a retort, to lengthen the distance between it and the receiver.

AERIFORM. Having the form of air or gas.

AGENT, CHEMICAL. Any substance which has a chemical action upon another.

AIR-HOLDER. A very useful apparatus for holding gases; it is very light, and is usually made of japanned tin or copper.

ALEMBIC. A distillatory apparatus, generally made of glass, but sometimes of metal, (see *fig. 2, plate* 1); it consists of two parts, which are fitted to each other by grinding, namely, the *cucurbit*, or lower part (*a*), which holds the

liquid, &c. to be distilled; and the *capitol*, or head (*b*), which is furnished with a channel all round it, and a spout; by which means the vapours are condensed, and the distilled liquid pours out of the spout (*c*).

AMALGAMATE. To combine a metal with mercury. *See* AMALGAMS, *in the Dictionary.*

ANALYSIS. That process by which we separate the component parts of compounds, and obtain a knowledge of their nature and proportions with regard to each other.

APPARATUS. WOULF'S, (*fig.* 1, *plate* 2). This is an ingenious and most useful apparatus, consisting of a series of vessels connected by means of tubes. It is very convenient in the distillation of those gaseous bodies which require the presence of water to effect their condensation.

The vessel in which the gas is generated being connected with the receiver (*a*), the gas passes through the bent tubes into the water in the bottles (*c c*), and any portion of it which cannot be condensed may be received in the pneumatic apparatus (*d d d*). In case of the gas being extricated from the materials with increased rapidity, the tubes (*b b*), which contain a column of water, allow a little of it to pass, and thus prevent all possibility of bursting the apparatus. For experimental purposes Woulf's apparatus is made of glass, but in manufactories earthenware is used.

APPARATUS, PNEUMATIC. The apparatus made use of for collecting and preserving various aëriform fluids; it chiefly consist of *gasometers*, and *pneumatic troughs*, which see.

AREOMETER. An instrument much used in France for ascertaining the comparative strength of brandy, alcohol, &c.; it consists of a glass tube and bulb, with a paper scale inside it, and the strength of the spirit is known by putting the instrument into it, and observing to what depth it sinks in the liquid.

Atmosphere. A term made use of in chemistry to signify the degree of pressure to which things are subjected. A pressure of 15 pounds upon the square inch constitutes one atmosphere; but if we augment it to 30, the substance on which we operate is said to be under a pressure of two atmospheres; that is, twice as much as it is subject to in common circumstances.

Attraction, Elective, or Chemical. That force by which bodies combine with each other.

We are not quite certain as to the cause of chemical attraction, but it is generally believed to be owing to negative and positive electricity, which attract each other. This seems very probable, and indeed it is almost beyond a doubt, for, if a body, which naturally contains negative electricity, and another naturally containing positive electricity, be mixed, and, at the same time, the former be electrified positively, or the latter negatively, the two substances will not combine, however great may have been their affinity for each other in the first instance. *For tables of the comparative force with which bodies combine with each other, see Note 5.*

B.

Basins, Evaporating. These are broad, shallow, basins, used in the evaporation of fluids; for vegetable infusions they are made of copper or iron, and if caustic alkalies are to be evaporated, they must consist of pure silver; but for all acids, salts, &c. those of Wedgewood's ware are found to be very convenient, as they are of a very close texture, and bear heat without cracking. *Fig.* 18, *plate* 1.

Balloon. A name given by the French to the large globular receivers used in distillation. *See* Receivers.

Base. A term used in chemistry to denote that substance which forms the principal or most solid part of a com-

pound: thus, an alkali is the base of a salt, and a metal is the base of an alkali.

Baths. That part of chemical apparatus which is used to protect glass or earthenware vessels from the too direct action of the fire; hence, when a distillation is performed in a glass retort, that part of the retort which is to be heated is immersed in an iron basin (*b*), (*fig.* 7, *plate* 1), full of sand, which is placed over the fire. Water, iron filings, and solutions of salts, are sometimes substituted for the sand, but this latter is found to be of the most general utility.

Blowpipe. The common blowpipe (*fig.* 3, *plate* 2), is a well known instrument, consisting of a brass tube, with a ball in the middle of it, and having a very small opening at one end; it is used for impelling the flame of a candle or lamp upon any minute substance which we wish to heat, and is often very convenient for assaying minerals, bending glass tubes, &c., and, when fixed to a small double bellows, small glass bulbs may be formed by its aid.

The Oxyhydrogen Blowpipe is an apparatus which acts by the combustion of a mixture of 1 part of oxygen, and 2 of hydrogen gases; it produces a more intense heat than any of our furnaces, and would have been generally used long ago, could this have been done with safety; but when the gaseous mixture is set fire to under common circumstances, the flame recedes into the vessel containing the gas, and the whole explodes with tremendous force. To prevent such accidents several plans have been adopted, but none has been found to combine safety with sufficiently powerful effects.

Being, however, lately engaged in some experiments in which iron filings were used, and observing that air could easily be made to pass through them, it suggested itself to me, that if the mixed gases were made to pass through a brass cylinder containing metallic filings, all possibility of

an explosion would be done away with; I consequently made the experiment, and found, that from the great conducting power of the filings for caloric (*matter of heat*), and the density with which they lie together, it was impossible to make the flame recede into the gas vessel, even when the whole of the pressure was removed, for it is immediately extinguished upon coming to the cylinder containing the filings. A blowpipe made upon this plan is very simple, and produces a most astonishing heat, as we are enabled by its safety to have the jet and flame much larger than those formerly used.

Fig. 5, plate 2, is the representation of this blowpipe, with which I have made numerous experiments; it consists of a bladder (*a b*), containing the mixed gases; a stopcock (*c*), which can be opened and shut at pleasure; and the brass cylinder (*d*), with the jet (*e*), from which the flame proceeds: the brass cylinder is about an inch in diameter; it has two little necks, with a small piece of wire gauze in each, to prevent the filings from falling out, and one of these necks screws on to the stopcock of the bladder, while the other is attached to the jet. In using this blowpipe pressure may be applied to the bladder by the hand, and as the flame consists of two cones, one inside the other, it is necessary to recollect, that the point of the inner cone gives the strongest heat; it fuses all sorts of earthenware, as well as platinum, marble, and many other substances which cannot be fused by any other means.

I have been enabled to work the above described blowpipe with such perfect safety, that I have used jets like the spout of a watering-pot, with five, or even seven apertures.

BOLTHEAD. *See* MATRASS.

BOTTLE, PEPYS. (*Fig. 4, plate 2.*) A bottle, with a spiral tube fixed to its neck; it is used for ascertaining the quantity of carbonic acid contained in chalk, pearl-ash, &c. and this is done by introducing a given weight of the chalk,

&c., and hydrochloric (muriatic) acid into it, when an effervescence takes place, and the loss in weight gives the quantity of carbonic acid.

BUTTON, METALLIC. A name given to the little round lump of metal which forms in the bottom of a crucible in which an assay is performed.

C.

CALCINE. To purify substances by the application of a red or white heat. The operation of calcination is usually performed in a crucible, but sometimes in the open fire. Formerly metals were said to be calcined when they were combined with oxygen.

CALORIMETER. An instrument for measuring heat or caloric.

CAPSUL. An earthenware vessel used in roasting metallic ores to evaporate their arsenic, sulphur, &c.

CAUSTIC. A term applied to those substances which decompose the flesh or skin of animals, at the same time producing heat.

CEMENTATION, is the operation of laying different substances in close contact in a crucible, in order that they may act upon each other when heated; thus, iron is cemented with charcoal to convert it into steel.

CLARIFY. To separate a sediment from any liquid, and thereby render it clear.

COAGULATE. To become concrete; thus, white of egg coagulates when heated.

COHESION. That force by which solid bodies are prevented from falling to powder.

COHOBATE. To distil repeatedly the same liquid with any substance with which we wish it to be impregnated.

COMBINE. To unite together. Bodies are said to combine, when they form a compound differing from both its

component parts, and not being decomposable by mechanical means.

COMBINATION, CHEMICAL. Combination, in chemistry, is the intimate union of the particles of one body with those of another, which union is so perfect, that the resulting compound differs from both its component parts. It is the consequence of what is called chemical attraction, which exists between one body and another; hence, if I mix sulphuric acid and pure potass together in certain proportions, although, when separate, they were both very corrosive substances, the compound resulting from their union will neither have an acid nor alkaline taste, nor will it be in the least degree corrosive, if the proportions used be those necessary for what is termed *mutual saturation.* But, if on the other hand, I mix some lemon juice and common syrup, the result will be a mere *mixture,* and not a *chemical combination,* because these bodies have no affinity for each other, and hence it will evidently taste of both the substances used in its formation.

The laws of chemical attraction, by which bodies unite, are as follows:

1st. Combination usually takes place between bodies of opposite natures, as between an acid and an alkali, oxygen and hydrogen, &c.

2nd. Bodies should be in a more or less minute state of division, according as they have a less or greater affinity for each other; because, if a lump of any substance be put in contact with another substance, to combine with it, for which it has not a strong affinity, the latter will not be able to overcome the force of cohesion of the former, and therefore cannot separate its particles enough to combine with them. Caloric, to a certain degree, assists chemical combination, by insinuating itself between the particles of the substance in question, and thus putting them in a more proper state to combine; but, if too much of it be applied, it

separates the particles beyond the sphere of attraction of each other, and thus decomposition sometimes takes place by the action of heat alone.

3rd. Combination may exist between a considerable number of substances at once.

4th. A change of temperature always takes place at the moment of combination, unless it be counteracted by some other circumstance; thus, if I pour sulphuric acid on pure potass, the mixture becomes intensely hot; but, if the potass be previously combined with a certain quantity of carbonic acid, no change of temperature takes place, but a strong effervescence commences immediately on mixing the two substances. The reason of these phænomena will be explained in the article CALORIC.

5th. The most striking properties of bodies, when in a separate state, are rendered innate by combination, and are not to be perceived again until the compound formed is decomposed.

6th. The strength of chemical affinity which bodies have for each other is measured by that which is required for their separation. *For tables shewing the comparative force of affinity which bodies have for each other, see Note 5.*

COMBUSTION. That operation by which bodies are combined with each other, at the same time part of their light and caloric (heat) being rendered sensible.

In all common combustions the combustible unites with the oxygen of the atmosphere.

CONCENTRATE. To render a fluid purer, stronger, and denser, by applying a heat sufficient to evaporate a part of its water.

CONDENSE. To become less fluid and bulky; thus, steam, if cooled, condenses, and forms water.

CORRODE. Whenever one body eats away or dissolves another, it is said to corrode it; thus, nitric acid (aqua fortis) corrodes copper.

Crucibles, are little pots made of *clay, plumbago, silver,* or *platinum,* for containing bodies to be exposed to the action of a red heat merely for the purpose of melting or calcining them. Crucibles must be of different materials, according to the nature of substances to be fused in them; they are made of different shapes, (see *fig.'s 2 and 4, plate* 1), and when used, they should always be raised about 1½ inch above the grate of the furnace in which they are placed.

Crystallize. To form crystals; to cause substances to assume some regular mathematical figure. The operation of crystallization is generally performed upon saline substances by dissolving them in water, evaporating so much of the fluid as to cause the remainder to be a saturated hot solution, and then allowing it to cool; by which means it deposits a great part of the salt, &c., so slowly as to allow it to take a crystalline form. But, with some salts, which are not more soluble in hot than in cold water, a different plan must be adopted, and in this case a solution of the salt is slowly evaporated, and the crystals form during the evaporation. Common salt can only be crystallized in this manner.

Cupel, *and* Cupellation. Cupels are small, shallow, round vessels, made of bone-ash, for the purification of gold and silver by cupellation with lead. *See Note 3, at the end of the volume.*

D.

Decant. To pour a liquid off a sediment or precipitate. In the decantation of a fluid off a light precipitate, it is often found very useful to warm the mixture gently at the fire; by which means any thing solid will settle to the bottom of the vessel with much greater rapidity than it would under common circumstances.

Decoct. To boil out; to extract the soluble part of a plant by boiling it in a liquid.

DECOMPOSE. To separate the component parts of a substance, and to cause bodies which have been chemically combined, no longer to have an affinity for each other. *See* COMBINATION, CHEMICAL.

DECREPITATE. To crackle and bounce by the application of heat; common salt decrepitates when thrown into the fire.

DEFLAGRATE. To burn with great activity and force; charcoal and nitre, when mixed, deflagrate if thrown into a red-hot crucible.

DELIQUESCE. To fall into a liquid, and become dissolved by attracting the water which is always contained in the atmosphere. Pearl-ashes deliquesce if exposed to air.

DEOXYDATE, to deprive any substance of oxygen.

DEPHLEGMATE. *See* CONCENTRATE.

DETONATE. Although this term is often used in a sense similar to that of *deflagrate*, yet it seems more properly to imply an action so much more violent as to produce explosion.

DIGEST. To macerate; thus, tea is made by digesting the leaves in water.

DISSOLVE. To render any substance fluid by combination with another; thus, salt becomes liquid by combination with a large quantity of water, and then it is said to be dissolved in the water; but, although chalk can be mixed with water, it can never be dissolved in it, as we only obtain a mechanical mixture of the two substances, which may be separated by mechanical means.

DISTIL. To convert the volatile parts of bodies into vapour by means of heat, at the same time collecting the vapour, and, in most instances, condensing it into the liquid or solid form by the application of cold in a proper apparatus. Distillation is usually performed in *retorts*, *alembics*, or *stills*, and it may be divided into three sorts, namely: *humid distillation*, which consists in the distilla-

tion of fluids, or solids mixed with fluids, as in the formation of distilled waters from plants; *dry, or destructive distillation*, which is generally performed at a red heat, and by which fluids are obtained from solids; and *sublimation*, by which dry substances are distilled, and dry products (generally called sublimates) are obtained.

E.

EDULCORATE. To wash a solid substance with a fluid, for the purpose of separating from it any soluble matter which it may contain.

EFFERVESCE. Liquids are said to effervesce when they throw up a number of small bubbles, accompanied with a hissing noise.

EFFLORESCE. To fall into a dry powder by exposure to air. Whenever crystallized salts effloresce, it is in consequence of their having a less affinity for the water, which their crystals contain, than the atmosphere has, and consequently as the air takes away their water, they become pulverulent.

ELIQUATION. A process by which two bodies, having different degrees of fusibility, are separated from each other; it consists in applying a degree of heat which will liquefy one of the substances, but has no effect on the other.

ELIXATE, or LIXIVIATE. *See* EDULCORATE.

EQUIVALENTS. *See* NUMBERS, EQUIVALENT.

EVAPORATE. To drive off the volatile parts of any substance by applying a heat sufficient to convert them into vapour.

EVAPORATORS. Small basins used for the evaporation of fluids. *See* BASINS, EVAPORATING.

EUDIOMETER. A graduated instrument for measuring gases, and principally used for ascertaining the proportion of oxygen gas contained in the atmosphere. See *fig.* 13, *plate* 2.

FERMENT. To undergo a spontaneous change by exposure to air. Fermentation is divided into three sorts: 1st. The *vinous fermentation*, by which alcohol is formed. 2nd. The acetous fermentation, the product of which is vinegar. 3rd. The *putrid fermentation*, by which organized bodies are entirely decomposed.

The vinous fermentation takes place in liquids containing sugar, and other vegetable substances, and it proceeds with the greatest rapidity at a temperature of about 70°; it consists in the conversion of sugar into alcohol, by a change which takes place in the proportions of its component parts. During the process carbonic acid gas is disengaged, and the taste and other properties of the fermented body are much altered.

The acetous fermentation takes place upon those bodies which have undergone the vinous fermentation; it consists in the conversion of alcohol into acetic acid (vinegar), and at a temperature of 80° it proceeds with great rapidity.

The putrid fermentation generally takes place in animal substances, but vegetables are also subject to it; these last, however, first undergo the vinous and acetous fermentation, while the former become putrid at once. During putrefaction sulphuretted hydrogen gas *(hepatic air)*, nitrogen gas *(mephitic air)*, and ammoniacal gas *(alkaline air)*, are disengaged. A small quantity of common salt assists putrefaction, and hence, when taken with the food, it facilitates digestion; but, if a large quantity of it be used, putrefaction is much retarded, as may be seen in the salting of beef and other meat.

In fermentation the air should always have free access to the fermenting body, as, by its oxygen, it effects the changes above described.

FILTER. To separate a liquid from any sediment or so-

solid particles it may contain, by straining it through blotting-paper, flannel, linen, sponge, or cotton. The substance made use of is called the *filter*, and if it be paper, a funnel is usually lined with it, and the liquor to be filtered is poured into the loose paper lining. If flannel or linen is used, it may be fixed to a wooden frame; but, sponge or cotton is put into the tail, or small end of a funnel, filled with the liquid, which penetrates by degrees, and drops into a vessel beneath.

FIXED. A body is said to be more or less fixed when it requires a great degree of heat to volatilize it.

FLASK. *See* MATRASS.

FLUID. All substances which have free motion among their particles are called fluids, but of fluids there are two sorts, namely, aëriform fluids, or gases, and liquid fluids. *See Dictionary, article* CALORIC.

FULMINATE. To explode by friction or heat.

FUNNEL. The common funnel is in such general use, that it is needless to describe it. For chemical purposes it is generally made of glass or earthenware, as metals would be corroded by acids.

The retort funnel is represented at *fig.* 12, *plate* 2; from its having a long bent neck, it is very useful in charging a retort, after it is placed in the sand-bath, as this can be done while the neck of the retort is in a horizontal position.

FURNACE. There are two sorts of furnaces, namely, *fixed furnaces* and *portable furnaces*; the former are made of bricks alone, but the latter are either earthenware, or iron, lined with bricks or clay. Both these are made of different forms, according to the purpose for which they are intended, and in consequence of their different forms and effects, different names are given to them.

The universal portable furnace is a most useful appendage to a laboratory, as in it may be performed almost all operations in a small way. It is represented at *fig.* 7, *plate*

l, but, as the limits of this work will not permit me to describe apparatus minutely, I cannot do better than refer the reader to Mr. Joyce, 11, Old Compton Street, Soho, whose descriptive catalogue of philosophical instruments will be found of the greatest utility, not only in describing apparatus, but also in shewing how to use it with ease and effect.

The melting furnace, for performing fusions, calcinations, &c. is generally made of bricks, (*fig.* 6, *plate* 1). The fuel is put in at the top, and for experimental purposes the inside diameter should be about nine inches.

The blast furnace may be fixed or portable; the latter is more convenient, but the former produces the strongest heat; it acts by means of double bellows, which excite the fire to the greatest degree. The portable blast furnace, (see *fig.* 1, *plate* 1), is divided into two parts, and the upper one (*a*), may be taken off at pleasure by means of the handle which is fixed to it; the bellows and frame are represented at (*b*).

The reverberatory furnace is generally made of iron plate, and lined with fire-bricks or clay; it is very useful in distillations, which require a red heat, roasting ores, cupellation, &c. &c. *Fig.* 11, *plate* 1, represents a furnace, which I have found particularly convenient in the distillation of pretty large quantities of phosphorus; it is one foot in diameter, and from the grate to the beginning of the dome it measures nine inches: (*a a*) is the ash-pit, with a door to allow of a draught of air; (*b b*) is the fire-place, separated from the ash-pit by a grate; it is meant to contain the burning coals, and the muffel, retort, &c.: (*c*) is a semicircular opening, to admit of the muffel (*fig.* 8); when not in use it is closed by means of an earthenware plug and an iron door with a latch: (*d d*) are two loop-holes cut, as it were, down through the edge of the furnace; they are intended to allow the necks of retorts to pass through them, while their bodies are exposed to the action of the fire:

(*e e*) is the dome, which is removed when a retort is to be placed in the furnace; it is lined with fire-clay, and serves to reflect the heat upon the retort: (*f*) is a door made like a plug; it may be opened for the purpose of adding fuel during a distillation or cupellation, and as it is above the fire-place, when opened it does not endanger the cracking of the retort, as the cold air which enters by it, rises immediately into the chimney (*g g*): (*h*) is a damper, which may be opened and shut at pleasure, to increase or diminish the draught. The above described furnace possesses the great advantage of allowing a retort with a very long neck to be hung in it, which can never be done if the neck is to be made to pass through a mere hole in the side of the furnace; it also produces a very intense heat, and as the coals are added from above, the retort, or muffel, may be entirely covered with them.

FUSE. To cause any substance, originally solid, to assume the liquid form by means of heat alone. Fusion is generally performed in vessels called CRUCIBLES.

G.

GALVANISM. That branch of the science of electricity which principally treats of those electric phenomena produced by chemical action.

GASOMETERS are machines for collecting and preserving gases in.

The water gasometer is used for operating on those gases which are not absorbed by water; it consists of a glass, tin, or copper bell, inverted in another vessel, which is filled with water. The gas is usually put in from the bottom by means of a tube, which passes quite through the water into the bell; the bell is counterpoised by weights and pulleys, and therefore as the gas enters, it rises higher in the water.

The mercurial gasometer is used for receiving those gases which are absorbed by water; it differs from the water ga-

someter in being much smaller, and being filled with mercury instead of water.

GONIOMETER. An instrument for measuring the angles of crystals.

GRANULATE. To separate any solid into small pieces by fusing it and pouring it into water. Granulation is usually performed upon metals.

GRAVITY, SPECIFIC. Specific gravity signifies the density or weight of any one body when compared to that of a certain standard. Water is the standard made use of in taking the specific gravity of all solids and liquids, and therefore its specific gravity is said to be 1,000; thus, as a given bulk of lead is eleven times and four tenths heavier than an equal bulk of water, the specific gravity of lead is said to be 11,400; but on the other hand, as a given bulk of alcohol is inferior in weight to the same bulk of water, in the proportion of about 8 to 10, its specific gravity is said to be about 800.

Atmospheric air is made the standard in taking specific gravities of gases.

H.

HALURGY. An old name used to signify that branch of chemistry which treats of salts, acids, and alkalies.

HYDROMETER. An instrument for taking the specific gravities of fluids.

HYGROMETER. An instrument for measuring the degree of humidity existing in the atmosphere.

HYALURGY. An old name for that branch of chemistry which treats of glass, enamel, &c.

I.

INCINERATE. To burn any substance to ashes with a view to deprive it of its oily and carbonaceous parts. Thus, sea-weeds undergo incineration before soda is obtained from them.

INFLAME. To cause a body to burn.

INFUSE. To digest any substance in a hot liquid with a view to extract its soluble parts. Common tea is an infusion.

L.

LABORATORY, CHEMICAL. A place properly fitted up for the purpose of performing those operations necessary in pursuing the science of chemistry. A laboratory should consist of a large room on the ground-floor, with two smaller rooms adjoining it. The large room should contain furnaces, retorts, crucibles, &c. &c., and in short, all apparatus which is in constant use, and one of the small rooms may contain a stock of all sorts of common apparatus, while the other is entirely reserved for scale-beams, and all delicate instruments formed of brass or steel. At one corner of the large room there should be a sink and brushes, &c., for washing bottles and other vessels which have been used; at the opposite end may be fixed shelves, on which bottles containing the different tests and chemical preparations which are used in chemical operations; the rest of the space may be filled up with convenient arrangements for apparatus. A large wide chimney is very useful, and under it may be performed all those processes in which disagreeable vapours are generated; blast furnaces and portable furnaces are also placed under it, and by this means their smoke is easily carried off.

LAMP. In operating in the small way, chemical lamps are of the greatest use; by means of them operations may be performed on the table, and heat may often be applied to substances in a much more convenient manner than by the use of a furnace.

The argand lamp, (*fig.* 10, *plate* 1), is so well known, that it is needless to describe it; when made for chemical

purposes it is rather lower than those on the common construction, and as it is trimmed with oil, and burns its own smoke, it is found to be both neat and economical.

The spirit lamp differs from a common oil-lamp, only in being generally made of glass; it is trimmed with spirits of wine, and is found particularly useful in small operations, which require neatness and despatch.

The blowpipe lamp merely consists of a shallow tin vessel, filled with a mixture of tallow and oil, in which a very thick wick is immersed. It is used for applying a red heat to any substance, by impelling its flame on the said substance by means of a blowpipe.

LEVIGATE. To reduce a solid to very fine powder, by grinding it on a flat stone with a muller.

LITURGY. An old name for that department of chemistry which treats of earths and stones.

LIXIVIATE. *See* EDULCORATE.

LUTES. Lutes are cements or plaisters used for preventing the escape of vapours from the junctures of two or more vessels, such as a retort and receiver, tubes, and Woolfe's bottles, &c.; they are also very useful for protecting vessels from the too immediate action of the fire, and stopping cracks in cast-iron and earthenware apparatus.

For luting any joints out of the reach of a burning heat, common glazier's putty will be found very useful; it adheres firmly when applied to a dry surface, and being partly composed of oil, it is particularly convenient when corrosive acid vapours are to be confined. It may always be kept ready formed in a laboratory, and, if a little dry, it is easily softened by kneading it in the hands.

Another very good lute may be formed merely by mixing linseed-meal with water, but it can only be employed when the vapours to be confined are not corrosive.

The most difficult lute to make is that commonly called

fire-lute, for, as it is to be subjected to a red heat, all animal or vegetable matter must necessarily be decomposed, and lose its tenacity. The composition which I have found most useful, is a mixture of two parts of sand, two of dry clay, and one of red lead; but, if it is to be exposed to a white heat, some asbestos is added, and the quantity of red lead is diminished. This lute seldom cracks, but is generally converted into a mass resembling stoneware, in consequence of the red lead which fuses and binds the whole together. It is particularly useful in mending cracks in cast-iron retorts, sand-baths, &c., and, if mixed with a little horse-dung, it may be used for coating glass vessels.

M.

MACERATE. Synonymous with to digest.

MALLEABLE. Malleability is a property which metals are said to possess, when they may be extended under the hammer without being broken; thus, lead, copper, and iron, are malleable.

MATRASS. Matrasses are glass vessels, of a globular form, and having long necks; they are used for performing the operation of digestion, and should be made of very thin glass, as otherwise they crack when exposed to heat. Earthenware matrasses are sometimes made, but, for all the common purposes of a laboratory clean oil-flasks answer perfectly well, (*fig.* 9, *plate* 2).

MERCURIFICATION. An operation, by which the old chemists supposed it possible to convert all metals into mercury.

METALLURGY. That part of chemistry which treats of the various operations performed upon metals.

MORTAR. The mortar is an apparatus of such general use, that little need be said about it. The sort of mortar used for crushing different substances should vary according to their hardness.

Steel and agate mortars are generally very small; they are used for pulverising very hard minerals, precious stones, &c.

Iron mortars are very useful for crushing brittle metals and metallic alloys, but they can never be used when the substance to be pulverized has corrosive properties.

Glass and Wedgewood ware mortars (*fig.* 6. *plate* 2), are most useful in a chemical laboratory, as they are not acted upon by any substances in general use; they also possess great hardness, and will bear a pretty strong blow without breaking.

MUFFLE. Muffles are small earthenware ovens, of a semicircular form, as represented at *fig.* 8, *plate* 1; they are made red-hot by placing them in a furnace, and they are used in roasting ores, cupelling gold, &c. to prevent the coals from coming in contact with the crucible or cupel.

A muffle is made to enter a furnace by means of a little semicircular door; and when thus placed, it remains surrounded by the fuel, while the cupel, &c. is inclosed within it.

N.

NUMBERS, EQUIVALENT OR PROPORTIONAL. Numbers, expressing that relative proportion of any substance which is equivalent in saturating power to 1 part by weight of hydrogen.

Thus, as one part of hydrogen requires 8 of oxygen, or 36 of chlorine, to form definite compounds, and as for the same purpose, 8 parts of oxygen unite with 28 of iron, 35 of zinc, 59 of tin, or 104 of lead, the equivalent numbers of these bodies are as follows: hydrogen 1, oxygen 8, chlorine 36, iron 28, zinc 36, tin 59, lead 104. The equivalent number of a compound is obtained by adding those of its component parts together; but sometimes bodies combine with each other in several proportions, as is the case with lead

and oxygen, which form three different compounds, namely:

The protoxide consisting of 104 lead, and 8 oxygen.
The deutoxide . . . . 104 lead . 12
The peroxide . . . . 104 lead . 16

The first of these compounds then consists of one proportional of lead, combined with one of oxygen, and its number is 112; the second contains a proportional and a half of oxygen, its number being 116; and the third contains two proportionals of oxygen, whence its number is 120. *For the equivalent number of simple bodies, see Note* 6.

P.

PARTING. An operation by which silver and gold are separated from each other. *See Dictionary, article* GOLD.

PELICAN. A very complicated sort of matrass, formerly much used. A common matrass, with a very long neck, answers all the purpose of a pelican.

PELLICLE. A little skin which forms upon the surface of a saline or other solution when partly evaporated.

PHLOGURGY. An old name for that part of chemistry which treats of combustible bodies.

PNEUMATIC TROUGH. *See* TROUGH, PNEUMATIC.

PRECIPITATE. When any substance is held in solution, we are said to precipitate it; if by the addition of a chemical re-agent we cause it to assume the solid form, and fall to the bottom of the liquid. The substance thus precipitated is called a precipitate.

PROPORTIONAL. *See* NUMBERS, EQUIVALENT.

PUTREFY. Bodies are said to putrefy when they undergo the putrid fermentation. *See* FERMENT.

PYROMETER. An instrument by which the heat of furnaces is measured.

Q.

QUARTATION. The operation of adding a sufficient quantity of silver to impure gold, to make the latter only one fourth of the whole.

R.

RE-AGENTS, CHEMICAL. Those compounds which are made use of in analysis and other chemical operations.

RECEIVER. There are two sorts of receivers, namely, gas receivers, and globular receivers. The former are open at the bottom, as represented by *fig.'s* 15 and 17, *plate* 1, and the latter are made use of for receiving liquids, during distillation, from retorts or stills (*a*) (*fig.* 1, *plate* 2).

RECTIFY. To purify by distillation.

REDUCE. This term, when applied to metals, signifies to deprive their oxides of oxygen, thus causing them to assume the metallic state.

REFINE. To purify silver or gold by cupellation.

REFRACTORY. Difficult of fusion.

REFRIGATORY. That part of distillatory apparatus which is used for cooling the vapour which rises in distillation, to convert it into a liquid or solid. *See* STILL.

RETORT. (*Fig.* 16, *plate* 1.) A vessel used for the purposes of distillation, and generally made of glass, earthenware, or iron. Glass retorts are always placed in a sand-bath, to prevent the heat from cracking them.

Iron retorts are not always of the form represented in the figure.

REVERBERATORY FURNACE. *See* FURNACE.

REVIVE. To reduce mercury to the metallic state.

ROAST. To drive off the volatile parts of a body by exposing it to the action of heat and air.

S.

SATURATE. To cause one body to combine with a sufficient portion of another to form a definite compound.

SCORIFY. To convert a metal into an oxide by the action of heat and air.

SMELT. To obtain metals from their ores in the large way.

SOLUTION. *See* DISSOLVE.

STILL. (*Fig.* 14, *plate* 2.) An apparatus used in distillation, and consisting of the cucurbit, or lower vessel (*a*), in which the materials to be distilled are placed, and the head through which the vapour passes into the refrigatory, or worm-tub (*b*), which consists of a tub containing cold water, through which a spiral pipe, connected with the still, passes, by which means the vapour is condensed during its passage.

Stills are generally made of copper, but sometimes of iron, tin-plate, and earthenware.

STRATIFY. To cause two or more bodies to act upon each other by placing them in any vessel in alternate layers.

SUBLIME. To distil any solid body with a view to obtain a solid volatile product. *See* DISTIL.

SYNTHESIS. That operation by which any substance which has been analysed is again formed from its component parts.

T.

THERMOMETER. This is an instrument in such common use that description is unnecessary; for the principles on which it acts, *see* CALORIC, in the Dictionary. Very delicate thermometers are sometimes made to act by the expansion of air; *fig.* 9, *plate* 1, represents an air thermometer.

TROUGHS, PNEUMATIC. A wooden or metallic trough,

which is filled with water or mercury for the purpose of collecting different gases.

The common pneumatic trough is a vessel about 6 or 9 inches deep, and 18 inches long; it may be made either round, as in *fig.* 10, *plate* 2, or square, as represented by (*d*), *fig.* 1. In this trough, about 1¼ inch below the top, is fixed a shelf nearly half its width, near the edge of which several holes, about an inch in diameter, are made.

This vessel, when in use, is filled with water, to about half an inch above the shelf. To collect a gas by means of this trough, a glass jar is immersed sideways into the water, and when full of the liquid, a perpendicular motion is given to it with its open end downwards, and in this position it may be placed upon the shelf, over one of the holes, without admitting any atmospherical air. A tube, connected with the vessel, in which the gas is produced, is made to convey it underneath the jar, into which it will ascend, while the water descends into the trough.

The mercurial pneumatic trough differs from the above-mentioned, principally in being of much smaller dimensions, in consequence of the great weight, as well as the high price of the metal with which it is filled. *Fig.* 12, *plate* 1, represents a section of one which, from its peculiar construction, requires but little to fill it; it is made use of for collecting all those gases which are absorbed by water.

V.

VITRIFY. To convert into a glass.

U.

USTULTATE. *See* CALCINE.

W.

WAY, DRY. An operation is said to be carried on in the dry way when no liquids are used.

WAY, HUMID. A term made use of to express exactly the contrary of the foregoing.

WELD. To cause two pieces of metal to form one by heat and mechanical power.

Z.

ZIMOTECHNY. An old term made use of to signify that part of chemistry which treats of fermenting bodies.

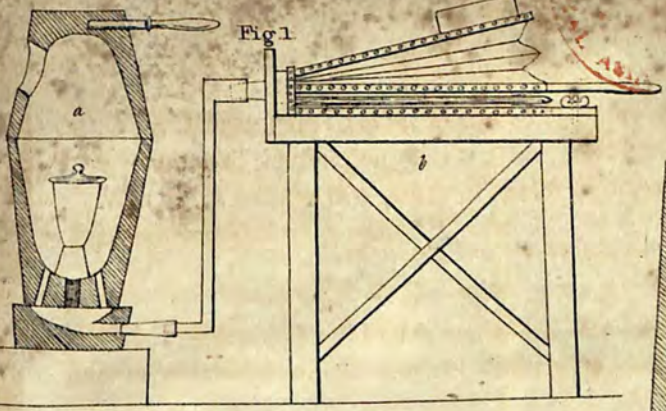


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

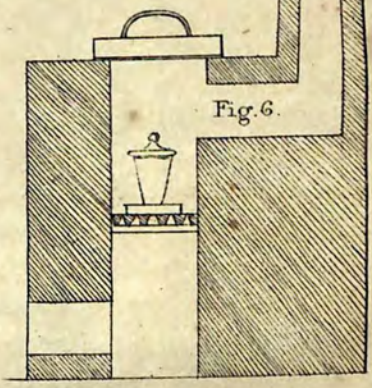
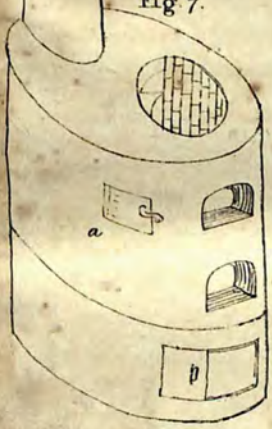


Fig. 6.

Fig. 9.

Fig. 7.



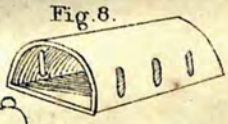


Fig. 8.

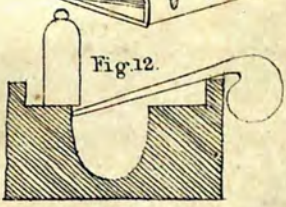


Fig. 12.

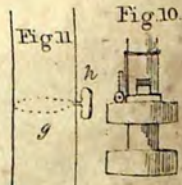
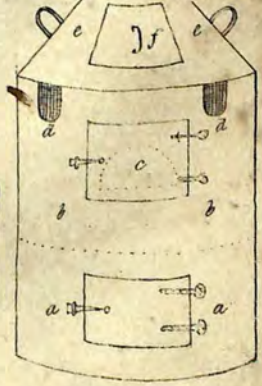


Fig. 11.

Fig. 10.

Fig. 13.

Fig. 16.



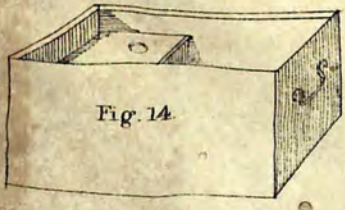


Fig. 14.

Fig. 15.

Fig. 17.

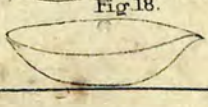


Fig. 18.

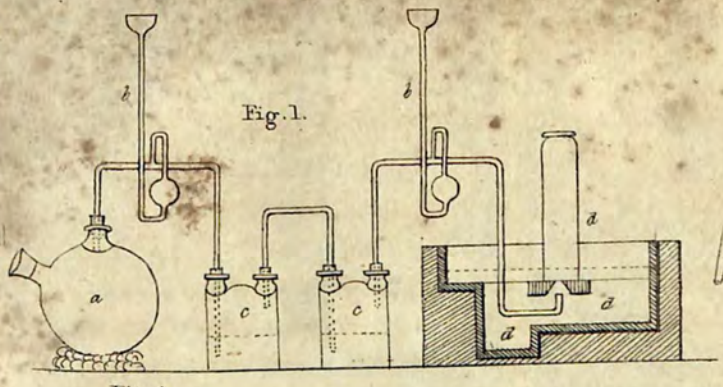


Fig. 1.
b
b
a
c
c
d
d
d

Fig 2
b
a

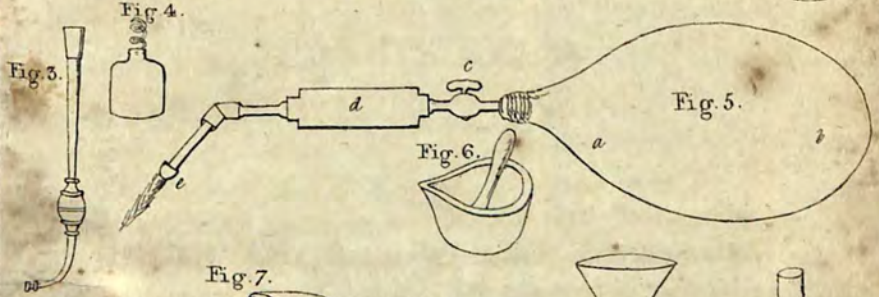


Fig 4.
Fig. 3.
c
d
Fig. 5.
Fig. 6.
a
b

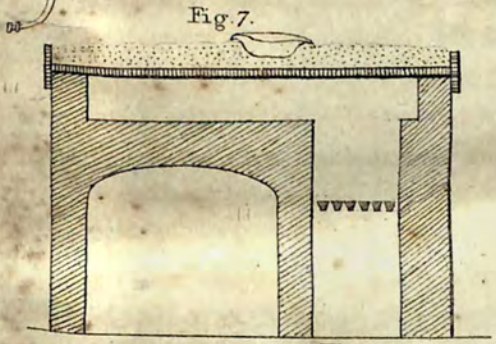


Fig. 7.

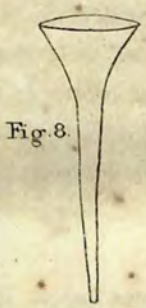


Fig. 8.

Fig. 9.

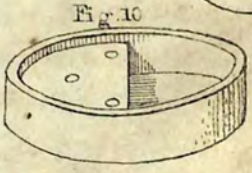


Fig. 10

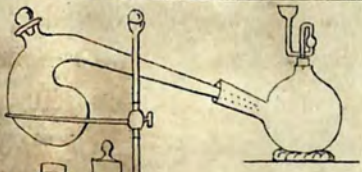


Fig. 11.

Fig. 13.

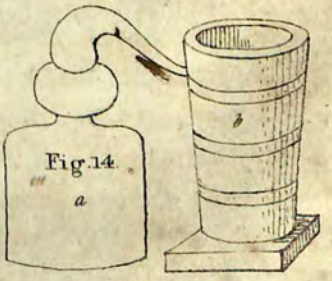


Fig. 14.
a
b

Fig. 12

A

DICTIONARY,

OF

CHEMISTRY, &c.

AC

ACETATES; formerly called *Acetites, Xylocrates, and Acetous Salts.*—A class of salts formed by the combination of acetic acid with alkalies, earths, or metallic oxides. They are, for the most part, very soluble in water; many of them are deliquescent, and their solutions are gradually decomposed, if left in contact with the air; they yield acetic acid if distilled with sulphuric acid, and at a red heat, they are all decomposed; leaving their base mixed with the portion of carbon, which had formed a component part of the acetic acid.

Acetites. *See* ACETATES.

ACID, ACERIC. A vegetable acid, which the juice of the Maple is said to contain; it is very little known, and, indeed, its existence as a peculiar acid is not satisfactorily proved. Like other vegetable acids, it is decomposed by heat.

Acid, Acetic; formerly called *Acid of Vinegar, Lignic Acid, Acid of Wood, Pyroligneous Acid, Fuming Acid of Vinegar, and Cupreous Spirit.*— This is the acid contained in vinegar, from which it may be obtained, in a pure and concentrated state, by saturating distilled vinegar with any earth or alkali, when, by evaporation, a salt is obtained, from which the acetic acid may be separated by distillation with sulphuric acid. It is, of course, a vegetable acid, consisting of hydrogen, oxygen, and carbon; and, when concentrated, it is very volatile and pungent, having rather an agreeable odour, and dissolving essential oils. When thus scented it is called aromatic vinegar. The concentrated acetic acid congeals at 38° of Fahrenheit's thermometer, and in this state it is called glacial, or crystallized acetic acid: it dissolves copper, lead, and some other metals, but not without the assistance of air, which effects the oxydation necessary before metallic solution can take place. This acid, when combined with water and mucilage, (as in distilled vinegar) was formerly distinguished from that in a pure state, under the appellation of *acetous acid;* because it was supposed to contain a smaller relative proportion of oxygen. But this opinion was erroneous; since it has been found, that the one may be converted into the other, merely by the addition or abstraction of mucilage.

If peroxide of barium be dissolved in acetic acid, and a protoxide be precipitated by the addi-

tion of sulphuric acid, the acetic acid will remain combined with a second portion of oxygen, and in this state it is called oxyacetic acid.

Acid, Acetous. *See* ACID ACETIC.

Acid, Aërial. A compound now called Carbonic acid, as it is found to consist of carbon and oxygen. It obtained the name of aërial acid, from its usually appearing in the gaseous state, and being but sparingly soluble in water. (*See* ACID, CARBONIC.)

Acid of Alumn. *See* ACID, SULPHURIC, which obtained this name, being sometimes procured by the dry distillation of alumn, at an intense heat.

Acid of Amber. *See* ACID, SUCCINIC, which is obtained from amber.

ACID, AMNIOTIC. A crystalline acid, obtained by gently evaporating the liquor of the amnios of a cow. It is of no importance.

ACID, ANTIMONIC. A combination of about 62 of antimony, and 38 of oxygen, commonly called the peroxide, or yellow oxide of antimony. It is called antimonic acid, because it combines with alkalies. It is easily obtained by acting on the oxides of antimony, or on pure antimony, with boiling nitric acid, and it is pulverulent and insoluble in water.

ACID, ANTIMONIOUS. A name lately given to the deutoxide, or white oxide of antimony, because it forms soluble compounds with alkalies. It contains less oxygen than the antimonic acid, and is of no use in the arts.

Acid of Ants. *See* ACID FORMIC, which is obtained from ants.

Acid, Aponitrous. A name formerly given to what is now properly called nitrous acid. *See* ACID, NITROUS.

Acid of Apples. *See* ACID, MALIC, which is obtained from apples.

ACID, ARSENIC; formerly called *Acid of Arsenic, and Arsenical Acid.* A compound of about 39 oxygen and 61 arsenic. If nitric acid be distilled off white arsenic (arsenous acid,) a white pulverulent acid will remain in the retort, which being very soluble in water, and uniting with salifiable bases to form soluble salts, is properly called arsenic acid. In this operation the nitric acid is converted into nitrous gas, it having given a part of its oxygen to the white arsenic, to convert it into arsenic acid.

The arsenic acid, when combined with alkalies, &c. forms the salts called arseniates. It is deliquescent, soluble in about twice its weight of cold water, and cannot be crystallized by evaporation; but if a hot saturated solution of arsenic acid be put into a glass-stoppered bottle, and allowed to cool, in about two days a part of the acid will separate in the form of grains, which are sometimes as large as a small pin's head.

Acid of Arsenic. *See* ACID, ARSENIC.

ACID, ARSENOUS; formerly called *White Arsenic.* A compound of about 30 oxygen and 70 of arsenic. White arsenic, or white oxide of

arsenic, being found to possess acid properties, is called arsenous acid. With alkaline bases it forms the salts called arsenites, and it is slightly soluble in water, but much more so in solutions of the alkalies. It is from the arsenous acid (which is abundantly found in commerce) that all the other compounds of arsenic are prepared.

For the properties of this substance as a salefiable base, *see* ARSENIC, OXIDE OF.

Acid of Balsam. *See* ACID, BENZOIC, which is sometimes obtained from balsam.

Acid, Baralithic. *See* ACID, TUNGSTIC. The word baralithic comes from the Greek words *baros lithos,* signifying ponderous stone; hence, the tungstic acid being obtained from a native tungstate of lime of a great specific gravity, the name of baralithic acid has been given to it.

ACID, BENZOIC; formerly called *Acid of Benzoin, Acid of Balsam, Benzoe Flowers, and Flowers of Benzoin, or Benjamin.*—This acid is obtained from the gum benzoin, either by simple sublimation or as follows. A rather weak solution of carbonate of soda is boiled for some time with a quantity of gum benzoin, until no more of it seems to be dissolved, the clear liquid is then separated by a filter, and on dropping into it some diluted sulphuric acid, the benzoic acid is precipitated from the soda by the superior affinity of the sulphuric acid used. Another very good method of obtaining it in beautiful crystals is, putting a quantity of concentrated sulphuric acid and gum benzoin into a flask or

alembic, which is to be heated over a lamp, when pure benzoic acid sublimes into the upper part of the vessel.

The benzoic acid is very combustible, and it unites with alkaline bases to form the salts called benzoates; it is sparingly soluble in water, but very soluble in solutions of the alkalies.

Acid of Benzoin. *See* ACID, BENZOIC, which is obtained from gum benzoin.

Acid of Berlin Blue. *See* ACID, HYDROCYANIC, which is procured from the pigment called Prussian, or Berlin blue.

ACID, BOLETIC. A crystalline and volatile acid found in the plant called the *Boletus Pseudo Igniarius;* it is of no use in the arts, and is very little known. It requires 180 times its weight of water to dissolve it.

ACID, BOMBIC; formerly called *Acid of Silkworms.*—A liquid acid, of a yellow colour, obtained by bruising silkworms, and infusing them in alcohol; it reddens vegetable blues, and unites with alkaline bases, to form the salts called bombates. It is of no importance, and very few chemists have made experiments upon it.

ACID, BORACIC, formerly called *Sedative Acid, Acid of Borax, Sedative Salt, and Narcotic Salt of Vitriol.*—A compound of boron and oxygen, generally supposed to consist of about 27 of the former, and 73 of the latter. This acid is obtained from borax, which is a subborate of soda, by the following simple process. A quantity of borax

being dissolved in hot water, diluted sulphuric acid is dropped into the solution, until it acquires an acidulous taste, when on being set aside to cool, the acid falls down in a flaky crystalline state. If this be separated by a filter, the liquid, by evaporation, will yield a further portion of the acid on cooling. Boracic acid, when mixed with alcohol, or other combustible substances, causes them to burn with a green flame, and when combined with alkalies, earths, &c. it forms the salts called borates. When the dry acid is mixed with a small quantity of concentrated sulphuric acid, it gives out a transient odour resembling musk. It is soluble in twelve parts of cold water, has no smell, and very little taste; and if dried gently it is fixed in the fire, but on being suddenly heated, while containing water, it sublimes in the form of crystals.

Acid of Borax. So called, because it is obtained from borax. *See* ACID, BORACIC.

Acid, Calcareous. *See* ACID, CARBONIC, which has obtained the name of calcareous acid, from its being found in all lime-stones and almost all calcareous minerals.

ACID, CAMPHORIC. A crystallizable acid, obtained from camphor, by distilling nitric acid off it. The camphoric acid remains in the retort, while the nitric acid, being deprived of part of its oxygen by the camphor, passes over in the state of nitrous gas.

The camphoric acid is of no use in the arts, and of very little consequence to the chemist; it

unites with alkaline bases, forming the salts called camphorates,

Acid, Carbonic; formerly called *Aërial Acid, Acid of Chalk, Cretaceous Acid, Calcareous Acid, Acid of Charcoal, Mephitic Acid, Choak Damp, and Fixed Air.*—The carbonic acid consists of about 27 parts carbon, and 73 oxygen; it is usually obtained in the form of a gas, but it has lately been condensed into the liquid state by cold and great pressure. Water, under common circumstances, absorbs a small quantity of carbonic acid, but when a certain pressure is applied, it absorbs so large a quantity as to become brisk and sparkling. Soda water owes its briskness to carbonic acid. Carbonic acid gas is given out in combustion, respiration, and fermentation; but the usual method of obtaining it, is by pouring a quantity of diluted hydrochloric, or sulphuric acid, upon chalk or marble, which are combinations of it with lime.

The carbonic is a very weak acid; it slightly reddens vegetable blues, but by heat they regain their original colour. If an animal be kept in carbonic acid gas, it dies for want of uncombined oxygen; and for the same reason a burning body is immediately extinguished by it. It unites with the alkalies, earths, &c. to form the salts called carbonates.

Carbonic acid gas is so much heavier than atmospheric air, that it may be poured from one vessel to another: it is a striking experiment, to

invert a jar of it over a burning candle, which it immediately extinguishes.

Acid, Caseic. An uninteresting acid, found in cheese. This name was given to it by Proust.

Acid, Cecidic. *See* Acid, Gallic.

Acid, Cetic. An acid obtained by decomposing soaps formed by spermaceti.

Acid, Cevadic. An acid very lately discovered in the seeds of the plant called *Cevadilla.* Its properties have not been examined, but it is said to be crystallizable, fusible, volatile, and soluble in water, alcohol, and ether.

Acid of Chalk. *See* Acid, Carbonic, which is a component part of chalk, and is often obtained from it.

Acid of Charcoal. *See* Acid, Carbonic, which is produced in large quantities by the combustion of charcoal.

Acid, Chloric, formerly called *Hyperoxymuriatic acid, or Hyperoxygenised Muriatic acid.*— This acid consists of chlorine 47, and oxygen 53, it is rather difficult to obtain it in an insulated state, and, indeed, for a long time this was considered impossible. It is a dangerous acid, being strongly explosive, when heated in contact with combustible substances. It has no smell or colour, but a very acid taste, and it may be concentrated by a gentle heat, until it acquires an oily consistency; but if it be exposed to a high temperature it is decomposed. The hydrochloric and sulphurous acids decompose it as well as sul-

phuretted hydrogen, and any other substance having a strong affinity for oxygen.

The chloric acid combines with salefiable bases, to form salts, called chlorates.

ACID, CHLORIODIC. A solid compound, of about 22 of chlorine, and 78 of iodine. It is of little consequence, not having been applied to any use. In combination with bases it forms the salts called chloriodates; it is of a yellow colour, and may be sublimed in close vessels.

ACID, CHLOROCARBONIC. This is a compound of chlorine and oxide of carbon. It has a pungent smell, and is capable of neutralizing a large quantity of ammonia. It reddens litmus paper, and decomposes the carbonate of ammonia, at the same time taking its base to form a chlorocarbonate.

ACID, CHLOROCYANIC, formerly called *Oxyprussic acid.*—This acid is obtained by passing chlorine gas through hydrocyanic acid, until it acquires the property of destroying vegetable colour. The liquid is then agitated with mercury, when (being put into a glass retort) an impure chlorocyanic acid is disengaged by heat, in the form of a gas. It was at first called oxyprussic acid, because it was supposed to contain oxygen; but as it is found to be composed of chlorine and cyanogen, the above name is now given to it.

It is sometimes called chloroprussic acid.

ACID, CHROMIC.—A combination of chromium, with more oxygen than is contained in either of its oxides. It has a metallic taste, is of an orange

colour, and may be dissolved in water, and crystallized. It is obtained from the red lead ore of Siberia, by boiling it with potass, and treating the solution obtained with weak nitric acid, which separates the alkali and oxide of lead.

The chromic acid unites with salifiable bases to form salts, called chromates.

Acid, Citreous. *See* ACID, CITRIC. All the vegetable acids being combustible, the termination *ous* was formerly given to them to indicate that they are not saturated with oxygen.

ACID, CITRIC; formerly called *Acid of Lemons, and Citreous Acid.*—An acid obtained from the juice of lemons, by saturating it with chalk, separating the insoluble salt formed, and decomposing it by digesting it in diluted sulphuric acid, when the citric acid remains in solution, and the sulphate of lime falls down by gently evaporating part of the fluid. The citric acid may be crystallized, and then it is used for making portable soda water powders; it unites with different bases to form salts, called citrates.

The portable soda water powders may be easily made, by mixing equal parts of perfectly dry citric, or tartaric acid, and bicarbonate of potass, both substances being previously reduced to powder. No action will take place as long as the mixture is kept dry, but on throwing about half a teaspoonful into a glass of water, an agreeable effervescing draught is immediately formed.

ACID, COLUMBIC. A combination of oxygen and columbium, which is insoluble in water, but

soluble in alkalies. It is very uncommon, and of no use in the arts.

Acid, Cyanic. An acid compound of oxygen and cyanogen. It is very little known, and its properties have not been examined.

Acid, Electric. A name formerly given to the electric fluid by some of the French chemists.

Acid Electrine. *See* Acid, Succinic, which obtained this name from the Greek word *Electron*, signifying amber.

Acid of Fat. *See* Acid Sebacic, which is obtained from fat.

Acid, Ferrocyanic. *See* Acid Ferruretted Chyazic.

Acid, Ferroprussic. *See* Acid Ferruretted Chyazic.

Acid, Ferruretted Chyazic; also called *Ferrocyanic Acid, and Ferroprussic acid.* An acid compound, discovered by Mr. Porret, and considered by some to be a compound of hydrogen, cyanogen, and iron, and by others merely a compound of cyanogen and iron.

Acid, Fluoboric. This acid is a compound of fluorine and boron, obtained by distilling a mixture of boracic acid and fluor spar, with sulphuric acid. It is gaseous, has a suffocating odour, and should be received over mercury, as it is easily absorbed by water. The following curious experiment depends upon the strong affinity of boron for oxygen, and of fluorine for hydrogen. If a piece of thin paper be suspended in the gas, it is immediately deprived of its oxygen and hydro-

gen, and nothing but black carbon remains, while a small quantity of hydrofluoric and boracic acid is formed.

Acid of Fluor Spar. *See* ACID HYDROFLUORIC, which is obtained from fluor spar.

Acid of Fluor Spar Dephlogisticated. *See* ACID, HYDROFLUORIC.

Acid, Fluoric. The hydrofluoric acid was formerly called by this name, from its being supposed to be a compound of an acidifiable base with oxygen, but as it has lately been decomposed, and found to consist of hydrogen, and a substance called fluorine, it has obtained the name of hydrofluoric acid. *See* ACID, HYDROFLUORIC.

Acid, Fluorine. *See* ACID, HYDROFLUORIC.

Acid, Fluorous. *See* ACID, HYDROFLUORIC, which was formerly considered as a compound of oxygen, with an acidifiable base, but from its volatility it was supposed to be an imperfect acid, only containing oxygen in the first proportion, as is the case with sulphurous acid, and hence they gave it the termination (*ous*).

ACID, FLUOSILICIC. A compound of fluorine and silicum, which is obtained when the fluorides are decomposed by an acid, in contact with silica. In this operation, the hydrofluoric acid, which is at first disengaged, gives its hydrogen to the oxygen of the silica, to form water, while the fluorine, uniting with the silicum, comes over in the state of fluosilicic acid gas. This acid cannot be combined with potass, soda, &c. for, when mixed with them, it is decomposed; thus, if I

mix a solution of potass, with fluosilicic acid, the oxygen of the water unites with the silicum, forming silica, which is precipitated, and a hydrofluate of potass remains in solution. If any small dead animal be enclosed in a jar of fluosilicic acid gas, decomposition of the acid ensues, and silica is deposited upon the surface of the animal, thus forming a sort of artificial petrifaction. *See* ACID, HYDROFLUORIC.

ACID, FORMIC. An acid liquor obtained by the distillation of ants with water, and formerly considered as a distinct acid. It has lately been found to consist of malic and acetic acids.

ACID, FUNGIC. A solid deliquescent acid, found in the juice of the *Boletus Juglandis;* it is of no consequence, but when combined with bases it forms the salts called fungates.

Acid, Fuming, of Vinegar. *See* ACID ACETIC, which is a very volatile and pungent fluid.

Acid, Galactic. *See* ACID LACTIC, which, being obtained from milk, had this name given to it from the Greek word *Galaktos.*

Acid, Galamelic. *See* ACID, MUCIC. The mucic acid being sometimes obtained from sugar of milk, this name was given to it from the Greek words *gala,* milk, and *meli,* honey, or sugar.

ACID, GALLIC; formerly called *Acid of Galls,* and *Cecidic Acid.*—The gallic is a crystalline acid, obtained from nut-galls; it was formerly supposed to constitute what is called the astringent principle, (because it is always found combined with it) but this is not the case. If a very strong aqueous

infusion of nut-galls be set aside in a cold place until its surface is covered with mould, small crystals will attach themselves to the sides of the vessel, which, being dissolved in alcohol, and the alcohol being evaporated to dryness, are pure gallic acid. Tincture of galls owes its property of precipitating the metals to the gallic acid which it contains, and the black colour of ink is caused by the formation of gallate of iron. Gallic acid, when combined with different saline bases, forms the salts called gallates. *For a table of the precipitates which different metals give with tincture of galls, see* GALLS, TINCTURE OF.

Acid of Galls. *See* ACID, GALLIC, which is obtained from nut-galls.

Acid of Gum. *See* ACID, MUCIC, which is obtained from gum-arabic.

Acid Gummic. *See* ACID, MUCIC, which is obtained from gum.

ACID, HYDRIODIC. An acid consisting of hydrogen and iodine, and much resembling the hydrochloric acid. It is obtained by passing sulphuretted hydrogen gas through a mixture of iodine and water, until it ceases to be absorbed by it, and concentrating the clear liquid obtained, by a gentle heat. The hydriodic acid is of a pale yellow colour, and it is somewhat less volatile than the hydrochloric acid; when the dry acid is mixed with alkalies, earths, or metallic oxides, a double decomposition takes place, the oxygen of the base uniting with the hydrogen of the acid to form water, and the disengaged iodine forming an

iodide of the metallic base of the alkali; if however, we use the acid and alkali in solution, we obtain a real hydriodate of the alkali used; but, upon evaporating it to dryness, an iodide of the metallic base of the alkali is formed. Besides the manner above mentioned for obtaining hydriodic acid, another very good one is, to put four parts of iodine and one of phosphorus into a small glass retort, applying a gentle heat, and adding a little water from time to time, when hydriodic acid gas is disengaged. It must be received over mercury as water absorbs it.

Acid, Hydrochloric; formerly called *Philosophic Spirit of Vitriol, Muriatic Acid, Acid of Sea Salt, Marine Acid, and Muriatous Acid.* The hydrochloric or muriatic acid is obtained from sea salt, or chloride of sodium, by distilling it with half its weight of sulphuric acid. It comes over in the form of a colourless gas, which is easily absorbed by water, forming the liquid hydrochloric acid. In this operation the oxygen of the water contained in the sulphuric acid unites with the sodium of the salt, to form soda, the hydrogen also combining with the chlorine to form hydrochloric acid. The sulphuric acid which induces this action, then unites with the soda, forming sulphate of soda, while the hydrochloric acid is volatilized.

The hydrochloric acid is decomposed by distillation with the black oxide of manganese, its hydrogen uniting with the oxygen of the latter to

form water, and its chlorine coming over in the form of a gas. *See* CHLORINE.

When dry hydrochloric acid and alkaline bases are mixed, double decomposition takes place, and a chloride of the metallic base of the alkali is formed; but if aqueous solutions of the acid and alkali be used, a hydrochlorate of the alkali is obtained. If ammonia be acted upon, no double decomposition ever takes place, but a hydrochlorate always results.

Liquid hydrochloric acid has a specific gravity of about 1200; when pure it is colourless, but what is sold in the shops generally contains some iron, which renders it yellow; it is used in the laboratory for a variety of purposes, as well as in commerce for cleaning boot-tops, taking out iron moulds, procuring chlorine for bleaching, &c.

Hydrochloric acid when out of the reach of water, and under common circumstances, is always aëriform, whence the gas may be preserved over mercury, but Mr. Faraday, of the Royal Institution, has lately transformed it into a liquid, by cold and pressure.

ACID, HYDROCYANIC; formerly called *Prussic Acid, Cyanotic Acid, Colouring Acid, Acid of Prussian Blue, and Acid of Berlin Blue.* A very volatile acid, having the smell of bitter almonds or peach blossoms, being colourless, and possessing all the properties of a deadly poison. It consists of hydrogen and cyanogen, and may be obtained by distilling cyanide of mercury with

hydrochloric acid. The hydrocyanic acid gas, which is disengaged by a gentle heat, may be condensed into a liquid by the application of cold, but the pure acid being very dangerous, on account of its poisonous property, the gas is generally received in water, which absorbs it. When dry, hydrocyanic acid is mixed with an alkaline base, its hydrogen unites with the oxygen of the base to form water, while the disengaged cyanogen forms a cyanide of the metallic base of the alkali used; but if aqueous solutions be acted upon, a hydrocyanate of the alkali itself is obtained. Ammonia, however, is an exception to this rule, as it always forms a hydrocyanate.

Pure liquid hydrocyanic acid boils at about 81½°, and congeals at about 3°, presenting a sort of fibrous appearance, like the crystallized nitrate of ammonia. Like the carbonic acid it reddens vegetable blues, but not permanently, as by exposure to air they regain their original colour.

Acid, Hydrofluoric; formerly called *Fluoric Acid, Fluorous Acid, Acid of Fluor Spar, Sparry Acid, Dephlogisticated Acid of Fluor Spar, and Fluorine Acid.*—The hydrofluoric is a liquid acid, consisting of hydrogen and fluorine, obtained by distilling fluor spar and sulphuric acid, in an apparatus of silver or lead. It acts upon silica, forming the fluosilicic acid, and hence it cannot be prepared in glass vessels.

With regard to the combinations of hydrofluoric acid with alkaline bases, it follows the

same rule as the hydrochloric and other hydrogen acids, that is, when the alkali and acid are used in a dry state, a fluoride of the metallic base of the alkali is formed; while if aqueous solutions be acted upon, a hydrofluate of the alkali results.

From the action which hydrofluoric acid has upon silica, it is often used for etching on glass. This is done with the diluted acid just in the same manner as copper-plates are etched by aqua-fortis.

Acid, Hydroprussic. *See* ACID, HYDROCYANIC.

Acid, Hydrothionic. A name given to sulphuretted hydrogen by some of the German chemists, because it combines with metallic oxides and has some other acid properties. *See* HYDROGEN, SULPHURETTED.

ACID, HYDROTELLUROUS. A gaseous compound of hydrogen and tellurium, which is soluble in water, and unites with alkalies. It is of no use in the arts, and of little interest to the chemist. It is sometimes called telluretted hydrogen.

Acid, Hyperoxymuriatic. *See* ACID, CHLORIC. When the hydrochloric or muriatic acid, was supposed to be a compound of a certain base with oxygen, the chloric acid was thought to consist of it, in combination with a much greater portion, and thus it obtained the name of hyperoxymuriatic acid.

ACID, HYPOPHOSPHOROUS. An acid compound of phosphorus and oxygen, containing less of the latter than phosphorous acid.

Acid, Hyposulphuric. An acid compound of sulphur and oxygen, containing more oxygen than sulphurous acid, but less than sulphuric acid; it combines with alkalies, earths, and metallic oxides, forming the salts called hyposulphates, which are all soluble in water.

Acid, Hyposulphurous. An acid composed of sulphur and oxygen, but containing less of the latter than sulphurous acid.

Acid, Iodic. A solid compound of iodine and oxygen, of no importance, but uniting with alkaline bases to form the salts called iodates.

Acid, Kinic, or Kenic. An acid obtained from the bark of cinchona: it is of no importance, and its salts are called kinates, or kenates.

Acid, Laccic. An acid obtained from white lac.

Acid, Lactic. An acid of little consequence, obtained from sour milk, by the following process. Evaporate a quantity of sour whey to an eighth part, and then filter it; saturate the liquid with lime-water, and phosphate of lime will be precipitated. Filter again, and dilute the liquid with three times its bulk of water; add to it just enough oxalic acid, drop by drop, to precipitate the lime which it contains; evaporate the solution to the consistency of honey; pour in a sufficient quantity of alcohol, and filter; add a small quantity of water, and distil the alcohol off in a glass retort; by which means the pure lactic acid will remain dissolved in the water after the spirit has

come over. It may be obtained in a concrete form by evaporating the water, and with alkaline bases it forms the salts called lactates.

Acid, Lampic. If a fine platinum wire, heated to redness, be introduced into the vapours arising from the surface of ether, it remains red hot, and a slow combustion of the ether takes place, the result of which is the lampic acid.

Acid of Lemons. *See* Acid, Citric, which is obtained from lemons.

Acid, Lignic. A name given to the acetic acid, when obtained from wood. *See* Acid, Acetic.

Acid, Lithic. *See* Acid, Uric, which was called lithic acid, from the Greek word *lithos*, a stone; as it is obtained from the concretions commonly called chalk-stones, which are found in the knees of gouty persons.

Acid, Malic; formerly called *Acid of Apples, and Melic Acid.*—An acid of little consequence, principally obtained from unripe apples, but contained in some other fruits. With alkaline bases it forms the salts called malates.

Acid, Manganesic, Acid, Manganeseous. *For a description of these two acids,* see Potass, Manganesite of.

Acid, Margaric. An acid having the smell of melted wax. It is obtained from pork grease, and its salts are called margarates.

Acid, Marine. *See* Acid, Hydrochloric, which is obtained from sea salt.

Acid, Marine, Dephlogisticated. *See* CHLORINE, which was formerly supposed to be hydrochloric, or muriatic acid, deprived of a substance imagined by Scheele to exist in all bodies, and called by him Phlogiston.

ACID, MECONIC. An acid contained in opium, and forming with alkalies the salts called meconates. It exists in opium in the state of a meconate of morphia.

ACID, MELASIC. The acid contained in melasses: it is supposed by some to consist of acetic acid.

Acid, Melic. *See* ACID, MALIC.

ACID, MELLITIC. An acid found in the mellilite or honey-stone, which is a combination of it with alumina; it is nevertheless considered as an acid of vegetable origin.

ACID, MENISPERMIC. An acid obtained from the seeds of the *Menispermum Cocculus*, and forming the salts called menispermates.

Acid, Mephitic. *See* ACID, CARBONIC, which obtained the name of mephitic acid, from its property of extinguishing animal life.

Acid of Milk. *See* ACID, LACTIC, which is obtained from milk.

Acid, Molybdænic, Acid of Molybdena. *See* ACID, MOLYBDIC.

ACID, MOLYBDIC; formerly called *Acid of Molybdena, and Molybdænic Acid.*—An acid obtained from the native sulphuret of molybdenum, by roasting it for some time, dissolving it in ammonia,

and precipitating it by nitric acid; the precipitate which falls is the molybdic acid, which, on being combined with alkaline bases, forms the salts called molybdates.

Acid, Molybdous. An acid containing less oxygen than the molybdic acid, and obtained by triturating it with metallic molybdenum. It is of a blue colour, and forms the salts called molybdites.

Acid, Moroxylic. An acid which has been found in combination with lime, on the bark of the white mulberry tree; its salts are called moroxylates.

Acid, Mucic; formerly called *Mucous Acid, Saccholactic Acid, Acid of Sugar of Milk, Galamelic Acid, Acid of Gum, and Gummic Acid.*—An acid usually obtained by distilling two parts of nitric acid and one part of gum arabic together, and lixiviating what remains in the retort, the insoluble part of which is the mucic acid. With alkalies it forms salts, called mucates.

Acid, Mucous. *See* Acid, Mucic.

Acid, Muriatic. *See* Acid, Hydrochloric, which was formerly supposed to be a compound of a base called muriatium with oxygen, but is now found to be a compound of hydrogen, and a substance called chlorine.

Acid, Myrmecic. *See* Acid, Formic, which obtained the name of myrmecic acid from the Greek word *myrmex*, signifying an ant.

Acid, Nanceic. *See* Acid, Zumic.

Acid of Nitre. *See* ACID, NITRIC, which is obtained from nitre.

Acid of Nitre, Phlogisticated. *See* ACID, NITROUS.

ACID, NITRIC; formerly called *Dephlogisticated Nitrous Acid, Acid of Nitre, Spirits of Nitre, Glauber's Spirit of Nitre, and Aqua-fortis.*—When nitre (nitrate of potass) is distilled in a glass retort, with two-thirds of its weight of sulphuric acid, a very corrosive liquid condenses in the receiver, which is nitric acid. This acid, when more or less diluted with water, forms what is called single or double aqua-fortis; it consists of nitrogen and oxygen, but it easily loses part of this latter, and is converted either into nitrous acid or nitric oxide; indeed, such is the weakness of its affinity for one portion of its oxygen, that oils, and many other substances, are often inflamed by pouring a quantity of strong nitric acid on them. Nitric acid dissolves almost all the metals, and in every case, nitric oxide is given out during the solution. It forms the salts called nitrates.

The nitric is one of the most useful acids we have, in the laboratory as well as in commerce. The facility with which it parts with oxygen, and dissolves metallic oxides, renders it particularly adapted to the solution of metals and their ores, as well as for etching on copper; but in analysis we should be very particular as to the purity of the nitric acid we use, as that found in commerce always contains chlorine and sulphuric

acid. To free it from these substances, nitrate of barytes should first be dropped into it, until no further precipitate of sulphate of barytes is formed, and then a solution of nitrate of silver is added, to throw down the chlorine, after which the whole is distilled almost to dryness, in a glass retort, and the liquid that comes over into the receiver is pure nitric acid.

The specific gravity of liquid nitric acid is about 1500, but as water is often added in the manufacture of it, it is sometimes found much lighter.

Acid, Nitromuriatic. When nitric acid, and hydrochloric acid (*muriatic acid*), are mixed, mutual decomposition takes place; the oxygen of the former uniting with the hydrogen of the latter to form water, while chlorine is liberated. It is to this chlorine that all the properties of nitromuriatic acid are owing. *See* CHLORINE.

ACID, NITROUS; formerly called *Phlogisticated Acid of Nitre, Fuming Acid of Nitre, Aponitrous Acid, and Fuming Spirits of Nitre.*—If nitric acid be deprived of part of its oxygen, it acquires the property of emitting copious red fumes, and is transformed into nitrous acid; its properties much resemble those of nitric acid, but it forms, by its combination with alkaline bases, salts called nitrites.

What is commonly called nitrous acid is far from being a definite compound, as it only consists of nitric acid impregnated with nitric oxide, from which it may be freed by heating it in a flask. Its

action on the metals is precisely the same as that of nitric acid, except that rather more nitric oxide is extricated during their solution. *See* ACID, NITRIC.

Acid, Nitrous, Dephlogisticated. *See* ACID, NITROUS, which obtained this name in the time of Scheele.

ACID, OLEIC. A name given to a part of fixed oils, which combines with alkalies in the formation of soap: according to this theory common hard soap should be called an impure oleate of soda. Soap also contains margaric acid.

ACID, OXALIC; formerly called *Saccharine Acid, Acid of Wood Sorrel, Acid of Sugar, and Oxaline Acid.*—The oxalic acid is obtained from the juice of wood sorrel, in which plant it is contained in the state of a superoxalate of potass; its crystals resemble those of Epsom salts, and hence accidents sometimes occur, in consequence of its being mistaken for that medicine. It is much used as a precipitant for lime, having a greater affinity for it than any other acid, and forming with it an insoluble salt. When combined with alkalies, earths, &c. it forms the salts called oxalates.

Oxalic acid is easily prepared in the small way by introducing six ounces of nitric acid into a tubulated retort, and gradually adding to it one ounce of powdered white sugar; heat is applied to assist the solution, and a large quantity of nitric oxide gas is disengaged. When the sugar is dissolved a receiver is to be fitted to the retort, and the dis-

tillation is to be continued until what remains in the retort has the consistency of syrup. This residuum, on cooling, will deposit crystals of the acid nearly equal to the weight of the sugar employed. The oxalic acid is used for cleaning boot tops, and taking out ink stains, and iron moulds. It effloresces in the air, is very soluble in water, and its solution is a violent poison.

Acid, Oxaline. *See* ACID, OXALIC.

ACID, OXYCHLORIC. A compound of chlorine and oxygen, containing more of this latter than the chloric acid.

Acid, Oxyodine. *See* ACID, OXYODIC.

Acid, Oxymuriatic. *See* CHLORINE, which was formerly supposed to be a compound of hydrochloric (*muriatic*) acid with oxygen: it was sometimes called *oxygenated muriatic acid.*

ACID, OXYODIC. A compound of iodine and oxygen, containing more of this latter than the iodic acid.

Acid, Perchloric. *See* ACID, OXYCHLORIC.

Acid, Perlate. A name given by Bergman to the biphosphate of soda.

ACID, PHOSPHORIC; formerly called *Acid of Phosphorus, Dephlogisticated Acid of Phosphorus;* and, when vitrified, *Animal Glass.*

The phosphoric acid is a compound, as its name implies, of phosphorus and oxygen, but it is usually obtained by the decomposition of bones, which have for their base a compound of it with lime; for this purpose, the bones are first burned until

nothing but a white ash remains, which, being pulverised and digested for two or three days with a large quantity of water, and half their weight of sulphuric acid, this latter takes possession of the lime, forming an almost insoluble sulphate of lime, while the phosphoric acid, with some phosphate of lime, remains in solution. The clear liquid being separated by a filter, a solution of carbonate of ammonia (of commerce) is added as long as any precipitate is formed, and being again filtered, it is evaporated to dryness. The mass which remains, consists of phosphate of ammonia, and if it be heated to redness in a crucible, the ammonia flies off, leaving phosphoric acid in a state of fusion. The dry phosphoric acid, when mixed with $\frac{1}{3}$ or $\frac{1}{2}$ of its weight of charcoal powder is decomposed at a red heat, and if the operation be performed in an earthenware retort, phosphorus and a quantity of phosphuretted hydrogen distil over. The phosphoric acid, in combination with different bases, forms the salts called phosphates.

Acid, Phosphorous; formerly called *Acid of Phosphorus, per deliquium, and Phlogisticated Acid of Phosphorus.* A compound of phosphorus and oxygen, containing less oxygen than the phosphoric acid, and usually obtained by exposing some sticks of phosphorus (on a funnel placed over a bottle containing some water) to the action of the air; hence its name of acid of phosphorus *per deliquium.* It forms the salts called phosphites.

Acid of Phosphorus, dephlogisticated. *See* ACID, PHOSPHORIC.

Acid of Phosphorus per deliquium. *See* ACID, PHOSPHOROUS.

Acid of Phosphorus, phlogisticated. *See* ACID, PHOSPHOROUS.

Acid of Ponderous Stone. *See* ACID, TUNGSTIC, which obtained the above name, because it may be procured from a native tungstate of lime, which has a great specific gravity.

Acid of Prussian Blue. *See* ACID, HYDROCYANIC, which may be obtained from Prussian blue.

Acid, Prussic. *See* ACID, HYDROCYANIC, which, since it received the above name, has been found to consist of hydrogen and cyanogen.

ACID, PURPURIC. An acid obtained from the lithic or uric acid, and differing for the most part from it, in forming purple salts with alkaline bases.

Acid, Pyroligneous. When acetic acid is obtained from wood by dry distillation, it is sometimes called pyroligneous acid. *See* ACID, ACETIC.

ACID, PYROLITHIC. An acid obtained in combination with ammonia, by subliming certain uric acid concretions.

ACID, PYROMALIC. An acid obtained by the distillation of common malic acid.

ACID, PYROTARTARIC. An acid obtained by distilling tartaric acid in a coated glass retort. It

requires to be purified, by saturating it with an alkali, crystallizing the salt formed, and then mixing it with diluted sulphuric acid, and subliming in a glass retort. *See* ACID, TARTARIC.

ACID, ROSASIC. An acid obtained from human urine.

Acid, Saccharine. *See* ACID, OXALIC, which is obtained by distilling nitric acid off sugar.

Acid, Saccholactic. *See* ACID, MUCIC, which is obtained from sugar of milk.

Acid, Saclactic. *See* ACID, MUCIC.

Acid of Sea Salt. *See* ACID, HYDROCHLORIC, which is obtained from sea salt.

Acid, Sebaceous. *See* ACID, SEBACIC.

ACID, SEBACIC; formerly called *Acid of Fat, Sebaceous Acid, and Steatic Acid.* A volatile acid found in animal fat, and usually obtained from rancid suet. It has been supposed to consist of acetic acid, while others consider it as a distinct acid. With alkaline bases it forms the salts called sebates.

Acid, Sedative. *See* ACID, BORACIC.

ACID, SELENIC. A crystallizable and volatile compound of selenium and oxygen. It is soluble in water, and has the taste and other properties of an acid. It is usually obtained by dissolving selenium in nitric acid, and subliming the selenic acid formed. Its compounds are called seleniates.

Acid of Silk-worms. *See* ACID, BOMBIC, which is obtained from silk-worms.

Acid, Sorbic. *See* ACID, MALIC, which is sometimes obtained from the berries of the mountain ash, called *Sorbus.*

Acid, Sparry. *See* ACID, HYDROFLUORIC, which is obtained from *fluor spar.*

ACID, STANNIC. A name sometimes given to the *peroxide* of tin, which is soluble in the alkalies. *See* TIN, OXIDES OF.

Acid, Steatic. *See* ACID, SEBACIC.

ACID, SUBERIC; formerly called *Acid of Cork.*—A white and pulverulent acid obtained from grated cork, by distilling it with six times its weight of nitric acid, specific gravity 1.26, and washing the residuum with boiling water, which dissolves the suberic acid. It is of no use in the arts, and when combined with alkaline bases it forms suberates.

ACID, SUCCINIC; formerly called *Acid of Amber, Salt of Amber, and Electrine Acid.*—A crystalline acid obtained from amber by sublimation; it may be further purified, by saturating it with a solution of potass or soda, boiling the compound with charcoal powder, decomposing the clear liquid by nitrate of lead, upon which a succinate of lead falls down, and then digesting this precipitate with diluted sulphuric acid, evaporating to dryness, and again subliming.

The succinic acid thus obtained is soluble in 24 times its weight of water; it reddens vegetable blues, and combines with alkalies, forming salts called succinates.

Acid of Sugar. *See* ACID, OXALIC.

Acid of Sugar of Milk. *See* ACID, MUCIC.

ACID, SULPHOVINIC. An acid obtained by digesting sulphuric acid and alcohol together, with the assistance of heat. It is supposed to consist of hyposulphuric acid, combined with a peculiar oily matter.

Acid of Sulphur. *See* ACID, SULPHURIC.

ACID, SULPHURIC; formerly called *Acid of Alumn, Acid of Vitriol, Vitriolic Acid, Universal Acid, Acid of Sulphur, Dephlogisticated Vitriolic Acid, Spirit of Vitriol, and Oil of Vitriol.*—The sulphuric is one of the most common and most important of the acids; it is much used in the arts, and is obtained in great abundance by the combustion of a mixture of sulphur, and nitrate of potass, in large leaden chambers, in which are placed quantities of water to absorb the acid as it is formed; this water, when sufficiently impregnated, is drawn off, and concentrated by boiling, when it is sold under the name of *oil of vitriol.* Sulphuric acid is found combined with different substances in nature, and it is of great use to the chemist, as it has a greater affinity for most bases than any other acid; thus giving a means of decomposing almost all salts. It may be decomposed by distillation with carbonaceous matter, and many of the metals, when sulphurous acid is given out. It acts powerfully on most vegetable and animal substances, producing heat, and carbonizing them, and, when

the concentrated acid is suddenly mixed with $\frac{1}{5}$ of its weight of water, it gives out so much heat as to raise the thermometer above 212. The sulphuric acid, or oil of vitriol of the shops, has a specific gravity of 1,850, but, if carefully heated almost to ebullition in a glass retort, it may be concentrated to 2,000. The combinations of sulphuric acid with alkalies, earths, &c. are called sulphates.

Acid, Sulphuric, dulcified. *See* ETHER, SULPHURIC.

ACID, SULPHUROCYANIC. A compound of Sulphur and hydrocyanic acid.

ACID, SULPHUROPRUSSIC. *See* ACID, SULPHUROCYANIC.

ACID, SULPHUROUS; formerly called *Volatile Acid of Vitriol, and Phlogisticated Vitriolic Acid.* —An acid compound of sulphur and oxygen, containing less of the latter than hyposulphuric or sulphuric acid, but more than hyposulphurous acid; it is usually obtained by distilling sulphuric acid off copper or mercury, and, in combination with alkalies, it forms sulphites. It is always gaseous in common circumstances, but at a very low temperature, or when under strong pressure, it becomes liquid. This liquid may be preserved in a glass-stoppered bottle for almost any length of time; for when it is opened, the part which escapes in the form of gas produces such intense cold as to render the remaining quantity perfectly fixed.

Sulphurous acid is always formed when sulphur is burnt in our atmosphere, and it is used with great advantage in the bleaching of silks, &c.

Acid of Tamarinds. An acid spoken of in old works, and found to consist chiefly of the malic and oxalic acids.

Acid of Tartar. Acid, Tartarous. *See* ACID, TARTARIC, which forms a component part of supertartrate of potass, commonly called tartar or cream of tartar.

ACID, TARTARIC; formerly called *Tartareous Acid, Acid of Cream of Tartar, and Acid of Tartar.*—A vegetable acid obtained from supertartrate of potass, (*cream of tartar*), by saturating it with chalk, separating the insoluble tartrate of lime formed, and mixing it with an equivalent quantity of diluted sulphuric acid; by which treatment, after some time, all the sulphate of lime falls, and the pure tartaric acid which remains in solution may be crystallized by evaporation. When saturated with alkalies, earths, &c. it forms the salts called tartrates.

Tartaric acid resembles the citric acid in taste, and, although it is not quite so acrid and strong, it may be used in the formation of soda-water powders. It is very soluble in water, and has been prepared by boiling supertartrate of potass and sulphuric acid together; but this process does not succeed well. Tartaric acid is used as a test to distinguish between potass and soda; when added in excess to the former alkali, it forms a

difficultly soluble salt, while its combination with the latter is very soluble.

Acid of Tungsten. *See* ACID, TUNGSTIC.

ACID, TUNGSTIC; formerly called *Acid of Tungsten, Acid of Wolfram, Baralithic Acid, and Acid of ponderous Stone.*—A combination of oxygen and tungsten, in the form of a yellow powder, which unites with alkalies to form tungstates. Tungstate of lime is found native.

ACID, TUNGSTOUS. A name lately given to the oxide of tungsten. Very little is known of its properties, and it has not hitherto been found applicable to any useful purpose.

Acid of Vinegar. *See* ACID, ACETIC.

Acid of Vitriol. *See* ACID, SULPHURIC, which is obtained from vitriol.

Acid of Vitriol, Volatile. *See* ACID, SULPHUROUS. The sulphurous acid was called volatile acid of vitriol, to distinguish it from the sulphuric acid, which requires a great heat to convert it into vapour.

Acid, Vitriolic, Dephlogisticated. *See* ACID, SULPHURIC.

Acid, Vitriolic, Phlogisticated. *See* ACID, SULPHUROUS.

Acid, Universal. *See* ACID, SULPHURIC, which, from its being found so plentifully in nature, was, in the infancy of chemistry, called the universal acid.

ACID, URANIC. A name given to the peroxide

of uranium, which has acid properties. *See* URANIUM, OXIDES OF.

ACID, URIC. An acid obtained from the sediment of human urine, and forming, with alkalies, the salts called urates. It is used as a test for nitric acid in a free state, with which, when boiled, it forms a beautiful rose-coloured liquid.

Acid of Wolfram. *See* ACID, TUNGSTIC, which is obtained from a mineral called wolfram.

Acid of Wood. *See* ACID, ACETIC.

Acid of Wood Sorrel. *See* ACID, OXALIC, which is sometimes obtained from sorrel.

ACID, ZOONIC. An acid said to be disengaged during the roasting of meat, and in the distillation of animal substances. It consists of acetic acid, combined with a peculiar animal matter. *See* ACID, ACETIC.

ACID, ZUMIC. An acid obtained from sour rice and many other vegetable substances when in a sour state. It has been called nanceic acid, but its properties have not been investigated.

ACIDS; formerly called *Acid Salts, and Acid Spirits.*—A numerous and interesting class of bodies, which are all compounds. Some of them contain a substance combined with oxygen, while others are compounds of a base with hydrogen. They have a sour taste, redden tincture of litmus, and many other vegetable blues; and they combine with alkalies, earths, and metallic oxides.

The names of acids partly composed of oxygen have two terminations, *ic* and *ous;* the termina-

tion *ic*, signifies that the base of the acid is saturated with oxygen, and the termination *ous* means that by a further combination of the same base with oxygen, another acid may be formed.

Acids, dulcified. A term made use of by old authors to signify ethers; hence, dulcified acid of nitre, for nitric ether, &c.

Acids, Hydrogen. Acids composed of a base with hydrogen, as the hydriodic and hydrochloric acids.

According to the present theory, the salts of hydrogen acids can only exist in a state of solution, for, if dried, the hydrogen of the acid unites with the oxygen of the alkali, forming water, and leaving the base of the alkali to combine with the base of the acid. Thus:

A hydrochlorate of potass,	*when dried, becomes*	A chloride of potassium.
A hydrochlorate of lime		A chloride of calcium.
A hydrochlorate of gold, that is, of oxide of gold		A chloride of gold.
A hydrocyanate of potass		A cyanide of potassium.
A hydrocyanate of mercury, that is, of oxide of mercury		A cyanide of mercury.

But ammonia is an exception to this rule, for, as it does not consist of oxygen and a metallic base, but of hydrogen and nitrogen, it always forms a real salt with the acid, whether dry or in solution.

ACIDS, OXYGEN. A generic term for those acids composed partly of oxygen.

ACIDS, VEGETABLE. Such acids as are obtained from the vegetable kingdom. They all consist of oxygen, hydrogen, and carbon, in different proportions, and are decomposed by a red heat.

ACONITA. A poisonous vegetable principle found in *wolfsbane*, and probably of an alkaline nature.

Adamant. *See* DIAMOND.

ADIPOCERE. A peculiar substance resembling spermaceti, which is found among animal substances which have lain for some time in large heaps under ground.

Aëriated, signifies carbonated. *See Acid, Aërial.*

Aërocrates. *See* CARBONATES.

Æthiops, Martial. *See* IRON, PROTOXIDE OF.

AGATE. A compound siliceous mineral, consisting of calcedony, jasper, amethyst, quartz, opal, heliotrope, and carnelian, intimately blended together. Very beautiful agates are found in Scotland, when they are called Scotch pebbles.

Air.—A name formerly given to all aëriform fluids, but now reserved for that only which surrounds the earth. *See* GAS, and AIR, ATMOSPHERIC.

Air, Alkaline. *See* GAS, AMMONIACAL.

AIR, ATMOSPHERIC. The air surrounding our globe, which consists of about four volumes of nitrogen, and one of oxygen. It always contains

some moisture, and a small quantity of carbonic acid gas, and it is by the oxygen, which the atmosphere contains, that respiration and all common combustions are supported.

Air, Azotic. *See* GAS, NITROGEN.

Air, Dephlogisticated. *See* GAS, OXYGEN.

Air, Dephlogisticated Nitrous. *See* NITROGEN, PEROXIDE OF.

Air, Fixed. *See* ACID, CARBONIC, which was called fixed air, because it so often occurs in the solid form when in combination, but, as soon as it is disengaged, it becomes gaseous.

Air of Fluor Spar. *See* ACID, HYDROFLUORIC, which is obtained from *fluor spar.*

Air, Hepatic. *See* GAS, SULPHURETTED HYDROGEN, which is obtained from alkaline sulphurets, formerly called *hepars.*

Air, Inflammable. *See* GAS, HYDROGEN.

Air, inflammable, heavy. *See* GAS, CARBURETTED HYDROGEN.

Air, Marine Acid. *See* ACID, HYDROCHLORIC, which always assumes the gaseous form at common temperatures, when out of the reach of water.

Air, Mephitic. *See* GAS, NITROGEN.

Air, Phlogisticated. *See* GAS, NITROGEN.

Air, Phlogisticated Nitrous. *See* NITROGEN, PROTOXIDE OF.

Air, Pure. *See* GAS, OXYGEN.

Air, Sulphurous Alkaline. *See* GAS, SULPHURETTED HYDROGEN.

Air, Vital. *See* GAS, OXYGEN. When oxygen

gas was first discovered to be the supporter of life in animals, it was named vital air.

Air, Vitriolated. *See* GAS, SULPHUROUS ACID.

Air, Urinous. *See* GAS, AMMONIACAL, which has a urinous smell, and is emitted in large quantities by putrefied urine.

Alabaster. A native sulphate of lime. *See* LIME, SULPHATE OF.

Album Græcum. The white and dry excrement of dogs, chiefly living upon bones, has been introduced into medicine under this name. It almost entirely consists of phosphate of lime, and has no other virtues than those of calcined bones, or hart's horn.

ALBUMEN. A substance coagulating by heat, or by mixture with alcohol. The white of an egg chiefly consists of it. It is soluble in cold water, but, when once coagulated, it can no longer be dissolved; and, at a low heat, it may be dried into a substance resembling horn. It is chiefly found in animal, but sometimes in vegetable substances, and it is precipitated from its solutions by acetate of lead, hydrochlorate of tin, nitrate of silver, tincture of galls, solution of tannin, and also by some other metallic salts.

ALCOHOL; formerly called *Spirit of Wine, and Ardent Spirits.*—A well known substance, consisting of oxygen, hydrogen, and carbon. It is always formed during the vinous fermentation, and, in distillation, it rises before the water of the brandy or wine made use of in its preparation.

It, however, always contains some water, from part of which it may be freed by distilling it off dry and caustic potass, but if it be required quite pure, it must be distilled off potassium, which decomposes the small quantity of water it may contain. Alcohol has a great affinity for resins, volatile oils, &c., which it dissolves, but, as it has a still greater affinity for water, the addition of that fluid to the solution, decomposes it; the water taking possession of the alcohol, and separating the oil or resin in the form of a milky or flocculent precipitate.

Alcohol is one of the most fluid substances we have; its specific gravity is about 800; it boils at 176° in the air, and, *in vacuo*, at 60°, but, it cannot be frozen even at a temperature of 65 below zero. It mixes with water in all proportions, and the bulk of the mixture is invariably less than that of the two substances before combination; at the moment the two substances are mixed heat is given out. It dissolves phosphorus, sulphur, and lime, in small quantities, and by the latter it is rendered yellow. The vapour of alcohol has been found to have much more expansive force than that of water. *For a table of the solubility of different salts in alcohol, see note* 12, *at the end of this volume.*

Algaroth, Powder of. *See* ANTIMONY, PROTOXIDE OF. This name was given by the old chemists to the protoxide of antimony, when prepared by putting the chloride of antimony into water. In this preparation there always remains

some chloride of antimony, unless it be washed with a solution of carbonate of potass.

Alkahest Glauberi. A solution of carbonate of potass, obtained by detonating nitrate of potass with charcoal, and allowing the salt thus obtained, to deliquesce in the air. Glauber seems to be the first who prepared it. *See* POTASS, CARBONATES OF.

Alkali, Aëriated Volatile. See AMMONIA, CARBONATE OF.

Alkali, Animal. See AMMONIA; which is often obtained from bones, horn, &c.

Alkali, Caustic Volatile. See AMMONIA.

Alkali, Concrete Volatile. See AMMONIA, CARBONATE OF.

Alkali, Fossil. Alkali, Marine. Alkali, Mineral. See SODA. Soda obtained the names of mineral, fossil, or marine alkali, from its forming a component part of rock and sea salt.

Alkali Phlogisticated. In the time of the phlogistic theory, it was supposed that *Prussian blue* (cyanide of iron) was a compound of iron with an abundance of phlogiston, and, therefore, as solutions of alkalies take the cyanogen (its real component part), from it, to form hydrocyanates, these hydrocyanates were called phlogisticated alkalies. Hence, we have phlogisticated lime, &c.

Alkali, Phlogisticated Volatile. See AMMONIA, HYDROCYANATE OF.

Alkali, Phosphorated Volatile. See AMMONIA, PHOSPHATE OF.

Alkali, Prussian. See POTASSIUM, CYANIDE OF.

Alkali, Spodic. *See* POTASS. *See Spodium.*

Alkali, Tartarized Volatile. A name formerly given to tartrate of ammonia.

Alkali, Vegetable. *See* POTASS.

Alkali, Volatile. *See* AMMONIA.

ALKALIES. Alkalies are bodies which combine with acids to form salts, and by this means render innate their acid properties. There are three classes of alkalies: 1st, those consisting of oxygen, and a metallic base, as potass, soda, and lithia; 2nd, those containing oxygen, hydrogen, and carbon, as morphia, veratria, and the other newly discovered vegetable alkaline principles; and 3rd, ammonia, which contains no oxygen.

All alkalies possess one or more of the following properties: 1st, solubility; 2nd, an acrid taste; 3rd, they turn the yellow colour of turmeric to brown; 4th, they form soaps with oil; and 5th, when combined with carbonic acid, they still remain soluble in water. This last property distinguishes alkalies from alkaline earths, the carbonates of which are insoluble.

Alkalies, Aërated. *Alkalies, Aëroxyc.* Carbonated alkalies.

Alkalies, Anaëroxyc. Alkalies deprived of carbonic acid.

Alkalies, Caustic. Alkalies deprived of carbonic acid.

ALKALIES, FIXED. A term applied to potass and soda to distinguish them from ammonia, which is very volatile.

Alkalies, Mild. Carbonated alkalies.

Allay. *See* ALLOY.

ALLOY. A compound of any metal with any other except mercury. Thus, brass is an alloy of copper and zinc, but a compound of mercury and zinc is called an amalgam of zinc.

The following are some of the alloys generally used in commerce. It is advisable, in making any of those containing copper, to melt it first with a little charcoal, and then to add the other more fusible metals.

Queen's metal, or *silver alloy,* contains tin, 100 parts; antimony, 8; bismuth, 1; copper, 4.

Tombac.—Copper, 16; tin, 1; zinc, 1.

Red tombac.—Copper, 11; zinc, 1.

Fusible alloy, (which is said to melt at 197° of Fahrenheit's thermometer) lead, 3; tin, 2; bismuth, 5.

Bronze metal.—Copper, 7; zinc, 3; tin, 2.

Pinchbeck.—Copper, 5; zinc, 1.

White tombac is sometimes called white copper; it merely consists of copper melted with a little arsenic and common salt.

ALUMINA; formerly called *Pure Argil, Argillaceous Earth, and Alumite.*—Alumina is an earth abundantly found in nature, and of great use in the arts. It forms the bases of all clays, giving them that degree of tenacity so necessary in the manufacture of porcelain, &c., and it is fusible in a very strong heat, forming a vitreous substance, which is so hard, as to scratch glass. The speci-

fic gravity of alumina is 2; with potass and soda it forms soluble compounds, known by the names of aluminous potass, and aluminous soda; it enters into the composition of several precious stones, and is, itself, supposed to be composed of oxygen and aluminum. It unites with acids, forming for the most part soluble salts, and is easily obtained by decomposing a solution of sulphate of alumina (*alumn*) by carbonate of potass; when a carbonate of alumina falls down, which may be deprived of its carbonic acid by heat. Alumina is not of much interest to the chemist, except in the formation of those colours called lakes, of which it always forms the base; the minerals, which consist chiefly of it, are generally very hard, and it may be separated from other earths, when in solution, by decomposing the whole by an alkali, collecting the precipitate formed, and digesting it in diluted acetic acid, by which means the other earths are dissolved, (except silica) and the alumina is left untouched.

ALUMINA, ACETATE OF. A soluble salt, much used by dyers, and formerly known by the name of *argillaceous xylocrate*. It is curious, that this salt cannot be formed by the direct mixture of its component parts, and hence it is always obtained by double decomposition; as by mixing acetate of soda with sulphate of alumina, when sulphate of soda and acetate of alumina are formed, and may be separated by evaporation and crystallization.

ALUMINA, HYDRIODATE OF. A compound of hydriodic acid and alumina. *See* ALUMINUM, IODIDE OF.

ALUMINA, HYDROCHLORATE OF; formerly called *muriate of alumina.*—A compound of hydrochloric acid and alumina, which is used in the analysis of mineral waters as a test for carbonate of magnesia, with which it produces a white precipitate, consisting of carbonate of alumina.

Alumina, Muriate of. *See* ALUMINA, HYDROCHLORATE OF.

ALUMINA, SULPHATE OF. The pure sulphate of alumina is a soluble salt, never met with in commerce, or used in the arts, but, when containing a small quantity of potass or ammonia; it is much used by dyers under the name of alumn.

ALUMINE. *See* ALUMINA.

Aluminite. A name given by mineralogists to native sulphate of alumina, containing water, and a minute portion of silica, lime, and oxide of iron.

ALUMINUM. The metallic substance which, by its combination of oxygen, forms the earth called alumina.

ALUMINUM, CHLORIDE OF. A compound of aluminum and chlorine, formerly known by the name of dry muriate of alumina; it remains chloride of aluminum as long as it is kept dry, but, as soon as it is put into water, double decomposition takes place, and a solution of the hydrochlorate of alumina is formed. *See* ACIDS, HYDROGEN.

ALUMINUM, IODIDE OF. A compound of alu-

minum and iodine. This substance being put into water, the hydrogen of the water unites with the iodine, forming hydriodic acid, and the oxygen, (the other component part of water) forms alumina with the aluminum, by which means a solution of the hydriodate of alumina is obtained.

Alumite. *See* ALUMINA.

Alumn or *Alum.* *See* ALUMINA, SULPHATE OF.

Alumn, Acid of. *See* ACID, SULPHURIC.

AMALGAMS. Compounds of any metal with mercury. They are usually made by pouring the melted metal upon the mercury, and then keeping the compound in a state of fusion for some time.

An amalgam of zinc may be formed, by melting one part of zinc, and pouring it into six of hot mercury; it is used for exciting electrical machines.

AMBER. A well known combustible substance supposed to be of mineral origin, and chiefly used in chemistry for the formation of succinic acid.

Amber, Acid of. *See* ACID, SUCCINIC.

AMBER, OIL OF. A volatile oil obtained from amber.

Amber, Salt of. *See* ACID, SUCCINIC.

AMETHYST. A precious stone, consisting merely of quartz, coloured by oxide of manganese; it is usually found crystallized in six-sided prisms, terminated by six-sided pyramids. *See* QUARTZ.

AMMONIA; formerly called *Volatile Alkali, Spirit of Hart's Horn, Ammoniac, and Diuretic Spirit of Sal Ammoniac.*—Ammonia is an alkali of a very volatile nature, consisting of hydrogen

and nitrogen. It may be decomposed by mixing a strong solution of it with liquid chlorine, which unites with the hydrogen to form hydrochloric acid, pure nitrogen gas being at the same time disengaged.

Ammonia may easily be obtained in the form of a gas, which must be received over mercury, as it is absorbed in great abundance by water; to this intent one part of hydrochlorate of ammonia (*sal ammoniac*) is well mixed with an equal weight of quick lime, when the mixture being heated in a retort, the gas is immediately disengaged. If, instead of receiving this gas over mercury, we impregnate water strongly with it, we obtain liquid ammonia, in which state it is always used in the arts as well as in the laboratory; it has a pungent, but not disagreeable odour, and it unites with some metallic oxides to form a class of bodies called ammoniurets.

Ammonia may be obtained in an impure state, by the dry distillation of horns, or any other animal substance, but it does not exist in these bodies before distillation, being formed during the operation by the action of heat, which causes their hydrogen and nitrogen to unite in the proportions necessary for its production.

Ammoniacal gas is lighter than atmospheric air, and water, by absorbing a large portion of it, has its specific gravity considerably lessened. The liquid which results is much used in medicine under the name of hartshorn, and, as it precipi-

tates some metallic oxides, and dissolves others, it is often very useful in analysis for separating one metal from another.

AMMONIA, BENZOATE OF. A soluble salt, easily obtained by digesting ammonia or its carbonate with benzoic acid and water; it is a useful reagent for precipitating iron from its per-salts, and is often employed to separate that metal from manganese, which is not precipitated by it; however, care should be taken that the solution be neutral, and, if not so at first, a small quantity of liquid ammonia should be added to it before the precipitant is made use of.

The precipitate obtained from a solution of iron, by means of this test, consists of benzoate of iron, and, when dried at 212°, it contains about 25 per cent. of the peroxide of the metal.

AMMONIA, CARBONATE OF; formerly called *Concrete Volatile Alkali, and Volatile Alkaline Salt.*—A combination of carbonic acid and ammonia, in the exact proportions necessary to constitute a true carbonate, is never found in commerce; that of the shops being properly called a sesquecarbonate. *See* AMMONIA, SESQUECARBONATE OF.

AMMONIA, HYDROCHLORATE OF; formerly called *Muriate of Ammonia, Sal Ammoniac, and Salmiac.*—This salt, which is commonly called muriate of ammonia, is an important article of commerce; it is volatile without decomposition, and

it occurs native. It is found in the shops in the form of large compact cakes, resembling spermaceti, and these by solution in water and evaporation, may be crystallized. Hydrochlorate of ammonia is of great use in the laboratory for a variety of purposes.

AMMONIA, HYDROCYANATE OF; formerly called *Prussiate of Ammonia.*—A salt consisting of hydrocyanic acid and ammonia. It is principally used as a test or precipitant for iron, with the proto-salts of which, it gives a white precipitate, but, with the per-salts, a blue precipitate is formed.

AMMONIA, HYDROSULPHURET OF; formerly called *Volatile Liver of Sulphur, and Boyle's fuming Liquor.*—A compound of sulphuretted hydrogen and ammonia, which is obtained in solution by distilling a mixture of 6 parts of slaked lime, 2 of hydrochlorate of ammonia, and 1 of sulphur, in a glass retort, connected with a Woulf's apparatus, in which some water is placed. The retort should be set in a sand bath, and gradually heated nearly to redness. The hydrosulphuret of ammonia, like other hydrosulphurets, is used as a test for metals. *See* HYDROSULPHURETS.

Ammonia, Muriate of. *See* AMMONIA, HYDROCHLORATE OF.

AMMONIA, NITRATE OF; formerly called *Flaming Nitre, and Ammoniacal Nitre.*—This is a salt of no consequence in commerce, but used in the laboratory for procuring nitrous oxide. It is easily obtained by dissolving the sesquecarbonate in di-

luted nitric acid, and crystallizing the salt by evaporation.

AMMONIA, OXALATE OF. A crystallizable salt, used as a test for lime, which it precipitates in the form of an oxalate. It is formed by the direct mixture of a solution of oxalic acid and liquid ammonia.

Ammonia, Prussiate of. *See* AMMONIA, HYDROCYANATE OF.

Ammonia, Salt of. *See* AMMONIA, SESQUECARBONATE OF.

AMMONIA, SESQUECARBONATE OF; formerly called *Volatile Alkaline Salt, Concrete Volatile Alkali, Sal Volatile, and Salt of Ammonia.* — The compound of carbonic acid and ammonia usually met with in commerce, is properly called a sesquecarbonate. It is much used in medicine under the name of sal volatile, and it may be sublimed by a heat even less than that of boiling water.

The sesquecarbonate of ammonia is much used in the laboratory for a variety of purposes, and it is a convenient substance, from which to form the nitrate and many other salts of ammonia.

AMMONIA, SUCCINATE OF. A soluble compound of succinic acid and ammonia, formed by the direct mixture of its component parts. It is recommended by Klaproth as a precipitant for iron, as it will separate that metal from manganese when both are dissolved together. In applying the succinate of ammonia as a precipitant, we should be

careful not to add it in excess, and the metallic solution should not be very acidulous. The iron is precipitated in the form of a succinate, which is heated to redness, first in the open air, and then with a little wax, by which means it is converted into an oxide containing about 70½ per cent. of iron.

Ammonites. A name given to those petrifactions commonly called snake-stones; they chiefly consist of carbonate of lime.

Ammonium. When potass and soda were first decomposed, ammonia was also supposed, by some, to be a compound of a metallic base with oxygen, and ammonium was the name chosen for this base. *See* AMMONIA.

AMMONIURETS. Ammonia combines with several metallic oxides, forming substances called by this name. Ammoniuretted oxide of gold, and ammoniuretted oxide of silver, are generally called fulminating gold, and fulminating silver, because they explode with violence by the least heat or friction.

Anaeroxyc. A term formerly applied to alkalies and earths void of carbonic acid; it is equivalent in this case to the word caustic.

Anhydrite. A mineralogical name for a native dry sulphate of lime. It comes from a Greek word, signifying void of water.

Antihecticum Poterii. A name formerly given to the white oxide or deutoxide of antimony, containing also oxide of tin, and oxide of iron.

ANTIMONY; formerly called *Pure Regulus of Antimony, and Stibium.*—Antimony is a brittle metal, of a greyish white colour, and having a specific gravity of about 6.860; it melts at a dull red heat, and, if much hotter, it burns, and is converted into an oxide. If a small quantity of this metal be brought to a strong red heat, and then be thrown up a short distance into the air, it will divide into a number of little globules, which present the appearance of a shower of fire, and run along the ground in all directions.

The proper solvent for antimony is chlorine, for which it has a great affinity, but, if it be digested in nitric acid, a violent action takes place, and the metal is oxydized, but sparingly dissolved. The chloride of antimony is decomposed if put into water, and by this means a precipitate of the protoxide of antimony is formed. Antimony is also soluble in a mixture of nitric and sulphuric acids, but it is always better to use chlorine.

Antimony is much used in the formation of different alloys which are used in the arts, and it enters into the composition of printing types; it also unites with iodine, sulphur, phosphorus, &c. and some of its compounds are much used in medicine.

Antimony, Amber of.—A preparation spoken of in old works, and consisting of sulphur and oxide of antimony. It may, therefore, be called a sulphuretted oxide of antimony.

Antimony, Argentine Flowers of. *See* ACID, ANTIMONIOUS.

Antimony, Butter of. *See* ANTIMONY, CHLORIDE OF. The name of butter of antimony was formerly given to this compound, because it is fusible at a very low heat.

Antimony, Ceruse of. *See* ACID, ANTIMONIOUS.

ANTIMONY, CHLORIDE OF; formerly called *Cinnabar of Antimony, Butter of Antimony, and Muriate of Antimony.*—Chloride of antimony is formed when antimony in powder is thrown into chlorine gas. As long as it is in a dry state it remains a true chloride, but, when put into water, it is decomposed, and a protoxide of antimony is precipitated. Chloride of antimony may be also formed by dissolving the metal in liquid chlorine, and evaporating to dryness; it is very fusible, and from this circumstance, it was formerly called *butter of antimony.*

Antimony, Cinnabar of. An old name for the chloride of antimony. *See* ANTIMONY, CHLORIDE OF.

Antimony, Crude. *See* ANTIMONY, SULPHURET OF.

ANTIMONY, DEUTOXIDE OF; formerly called *White Oxide of Antimony, and Diaphoretic Antimony.*—A compound of antimony with two proportionals of oxygen. It is soluble in alkalies, and hence it is called antimonious acid. *See* ACID, ANTIMONIOUS.

Antimony, Diaphoretic. *See* ANTIMONY, DEUTOXIDE OF.

Antimony, fixed Sulphur of. *See* ACID, ANTIMONIOUS, AND ANTIMONY, DEUTOXIDE OF. This name was given to the antimonious acid, because it resembles sulphur, but is not volatile.

Antimony, Glass of. *See* ANTIMONY, PROTOXIDE OF, which is called glass of antimony when fused.

Antimony, Golden Sulphur of. This appears to be a compound of protoxide of antimony and sulphur, containing more of this latter than the old preparation, called *amber of antimony*.

Antimony, Grey. *See* ANTIMONY, SULPHURET OF, which is of a dark grey colour, and has a metallic lustre.

Antimony, Grey Oxide of. *See* ANTIMONY, PROTOXIDE OF.

ANTIMONY, IODIDE OF. A compound of iodine and antimony, of no consequence. It is insoluble in water, and of an orange colour, but nitric acid decomposes it.

Antimony, Liver of. A sulphuretted oxide of antimony.

Antimony, Martial Regulus of. The sulphuret of antimony is sometimes deprived of its sulphur by melting it with $\frac{1}{3}$ of its weight of iron filings; in this case the antimony takes up a portion of the iron used, and hence it was formerly called by the above name from the word Mars, which in chemistry signifies iron.

Antimony, Medicinal Regulus of. A name for crude antimony, or sulphuret of antimony once fused, in which operation it loses part of its sulphur.

Antimony, Muriate of. *See* ANTIMONY, CHLORIDE OF.

Antimony, Ochre of. An ore of antimony of a reddish colour; it consists chiefly of oxide of antimony.

ANTIMONY, PROTOXIDE OF; formerly called *Grey Oxide of Antimony, Grey Calx of Antimony, Glass of Antimony.*—This is a compound of oxygen and antimony, containing about 84 per cent. of the metal. It often occurs in analysis, and is the best compound by which to judge of the quantity of antimony contained in any ore. To obtain it in a state of purity a solution of antimony in chlorine should be mixed with a quantity of water, when the oxide which falls, is to be washed with carbonate of potass, and calcined at a red heat. The clear liquid, from which it was separated, being evaporated almost to dryness, will yield a further portion of the oxide on being put into water.

The protoxide is the only oxide of antimony which unites with acids, but the exact proportions of its component parts are not accurately known.

Antimony, Regulus of. *See* ANTIMONY.

ANTIMONY, SULPHURET OF. A compound of sulphur and antimony found abundantly in nature. It is the only ore of antimony which is

worked in the large way, and it is known in commerce under the name of antimony, or crude antimony. It is with difficulty freed from its sulphur by mere roasting, but, if mixed with iron filings, it is easily decomposed by a red heat.

Antimony, Tartarised. *See* POTASS AND ANTIMONY, TARTRATE OF.

Antimony, White Oxide of. *See* ACID, ANTIMONIOUS.

Antimony, Yellow Oxide of. *See* ACID, ANTIMONIC.

ANTISEPTIC. A term applied to substances which prevent or cure putrifaction. Charcoal is a powerful antiseptic, and hence, water keeps best in wooden vessels which are charred inside.

Ants, Acid of. *See* ACID, FORMIC.

Apatite. A mineralogical name for native phosphate of lime.

Aperient of Mars. A name formerly given to the red oxide, or peroxide of iron, which was used in medicine as an aperient.

Aphronatron. Aphronitrum. Terms formerly indiscriminately given to a native carbonate of soda found in Egypt.

Apples, Acid of. *See* ACID, MALIC.

Aqua Celestis. *See* COPPER, AMMONIURET OF, which obtained this name from its fine azure blue colour.

Aquafortis. *See* ACID, NITRIC, which is called by this name because it dissolves metals.

Aquafortis, Dyer's. An impure nitric acid, containing a pretty large quantity of chlorine, which arises from chloride of sodium, (*common salt*) being contained in the nitre used in its preparation.

Aquafortis, Precipitated. As the aquafortis, or nitric acid, of commerce often contains chlorine, it is sometimes purified by dropping a solution of nitrate of silver into it, when a precipitate of chloride of silver takes place. When thus purified, it is called by the above name. *See* ACID, NITRIC.

Aqua Regia, or Regis. *See* CHLORINE, which formerly obtained this name from its property of dissolving gold.

Aqua, Sapharina. *See* COPPER, AMMONIURET OF.

Aqua Vitæ. A name given by manufacturers to the weak alcohol obtained without rectification.

Aquila Alba. A name formerly given to the chloride of mercury, commonly called calomel. *See* MERCURY, CHLORIDE OF.

Arcanum Duplicatum. A name formerly given to the sulphate of potass. *See* POTASS, SULPHATES OF.

Argentum Musivum. An amalgam of mercury, tin, and bismuth, which, by friction, gives metallic bodies the appearance of silver.

Argil, Pure. *See* ALUMINA.

Aroma. A term used to signify the odour of vegetables.

Aroma Philosophorum. Aroph Paracelsi. Names

formerly given to a hydrochlorate of ammonia containing oxide of iron.

ARSENIATES; formerly called *Arsenicrates and Arsenical Salts.* A class of salts formed by the combination of arsenic acid with alkalies, &c. The most important of them may be found under the heads of their bases.

The alkaline arseniates are very soluble, but the arseniates of earths and metals are generally insoluble; they all give out an arsenical odour when thrown upon red-hot coals, at the same time being decomposed. If sublimed with charcoal powder or oil, they yield metallic arsenic.

ARSENIC; formerly called *Regulus of Arsenic.* —Arsenic is a brittle metal, of a bluish white colour, and crystalline texture, having a specific gravity of about 5.760; it is easily tarnished by the action of air, but remains unchanged under water. It is volatilized at a red heat without being fused, and, when heated, it gives out a strong odour resembling garlic.

Metallic arsenic is most easily obtained by mixing common white arsenic (arsenous acid) with linseed oil, and subjecting it to a red heat in an earthenware retort, when the arsenic, being reduced, sublimes and concretes in the form of a crystalline cake.

Arsenic combines with oxygen in two proportions, the one forming oxide of arsenic, or arsenous acid, and the other, forming arsenic acid; when thrown into chlorine gas, it burns, and

is converted into a chloride. It also unites with iodine, phosphorus, sulphur, &c. and forms a gaseous compound with hydrogen. In obtaining metallic arsenic, a green glass retort placed in a crucible full of sand is often very convenient.

Arsenic, Acid of. *See* ACID, ARSENIC.

Arsenic, Butter of. *See* ARSENIC, CHLORIDE OF.

Arsenic, Calx of. *See* ACID, ARSENOUS. *See* ARSENIC, OXIDE OF.

ARSENIC, CHLORIDE OF; formerly called *Muriate of Arsenic, and Butter of Arsenic.*—When powdered arsenic is thrown into chlorine gas, it burn and forms a chloride of arsenic, which if put into water, is decomposed, and arsenous acid, or oxide of arsenic, is precipitated.

ARSENIC, NITRATE OF. We have, in fact, no real combination of nitric acid and arsenic, for, when these two substances are made to act upon each other, the former is decomposed, imparting oxygen to the latter, and converting it into arsenic acid. *See* ACID, ARSENIC.

ARSENIC, OXIDE OF. This substance, which has acid properties, also combines with other acids; thus acting the part of a base and of an acid. It may be combined with hydrochloric acid, by digesting the two substances together, but, if it be acted upon by nitric acid, arsenic acid is formed.

The oxide of arsenic may be reduced to the metallic state by sublimation with oil or charcoal; it

combines with alkalies, and is sometimes called arsenous acid. *See* ACID, ARSENOUS.

Arsenic, Red. A red sulphuret of arsenic. *See* ARSENIC, SULPHURET OF.

Arsenic, Regulus of. *See* ARSENIC.

ARSENIC, SULPHURET OF; formerly called *Red or Yellow Arsenic.—Orpiment* when yellow, and *Realgar* when red.—A compound of about 58 arsenic, and 42 sulphur, which is found native of a yellow or red colour, and may be formed artificially by slowly fusing a mixture of metallic arsenic, or arsenous acid and sulphur, when a red sulphuret, usually called realgar, is obtained. It is used in the arts as a pigment, and is found native in Germany and Switzerland, in veins, or among volcanic matter.

Arsenic, Volatile Liver of. Arseniate of ammonia.

Arsenic, White. *See* ARSENIC, OXIDE OF.

Arsenic, Yellow. A yellow sulphuret of arsenic. *See* ARSENIC, SULPHURET OF.

Arsenicrates. *See* ARSENIATES.

ARSENITES. The salts formed by the combination of arsenous acid with alkaline bases.

Ashes, Blue. An impure carbonate of copper.

Ashes, Metallic. *See* OXIDES, METALLIC.

ASPARAGIN. A peculiar vegetable principle, which is obtained in the form of white crystals, by evaporating asparagus juice to the consistence of syrup, and allowing it to stand in a cool place. It

is soluble in hot water, sparingly so in cold water, and insoluble in alcohol.

ASPHALTUM. A bitumen found in many parts of the globe, and consisting of mineral tar indurated by exposure to the air.

Atramentum Sympatheticum. A name formerly given to the hydrochlorate of cobalt, which is used as a sympathetic ink. *See* COBALT, CHLORIDE OF.

ATROPA OR ATROPIA. A poisonous vegetable principle, lately obtained from the deadly nightshade. It is probably of an alkaline nature.

Aurum Graphicum. An impure native tellurium containing gold. *See* TELLURIUM, ORES OF.

Aurum Musivum. A bisulphuret of tin, having the appearance of gold. *See* TIN, SULPHURETS OF.

Aurum Paradoxicum. Aurum Problematicum. Names formerly given to an impure native tellurium containing some gold. *See* TELLURIUM, ORES OF.

AVANTURINE. A species of quartz containing mica; it is generally of a brownish colour, and is chiefly found in Spain, but sometimes in Scotland.

Azot. *See* NITROGEN.

Azot, Chloride of. *See* NITROGEN, CHLORIDE OF.

Azot, Iodide of. *See* NITROGEN, IODIDE OF.

AZURE-STONE. *See* LAPIS LAZULI.

AZURITE or LAZULITE. A beautiful blue mineral, containing about 65 per cent. of alumina; it is slightly translucent, has a vitreous lustre, scratches glass, and is found crystallized, or in small masses imbedded in mica-slate.

B.

BALSAMS. Vegetable substances having a fragrant smell, and containing benzoic acid, which sublimes from them when heated. They are semifluids, and are obtained by making incisions in the trees which afford them.

Baralithocrates. An old name for the salts now called TUNGSTATES. *See Acid, Baralithic.*

Barilla. The ashes of sea-weeds somewhat purified, and containing a large quantity of carbonate of soda, which is always obtained from it in commerce.

BARIUM. The metallic base of the earth barytes, which is a protoxide of barium; it also unites with a second portion of oxygen, forming a peroxide. *See* BARIUM, OXIDES OF.

BARIUM, OXIDES OF. Barium combines with oxygen in two proportions, forming the protoxide, (*see* BARYTES) and the peroxide; this latter is easily obtained by passing oxygen gas over barytes at a red heat, when a large portion of it is absorbed, and a peroxide of barium results. This compound is used for obtaining what is usually

called oxygenated water, or peroxide of hydrogen. *See* WATER, OXYGENATED.

BARIUM, PEROXIDE OF. A combination of barium with the largest portion of oxygen. *See* BARIUM, OXIDES OF.

BARIUM, PROTOXIDE OF. A compound of barium with the smallest portion of oxygen. *See* BARYTES.

Barolite. A mineralogical name for native carbonate of barytes.

BARYA OR BARYTA. *See* BARYTES.

BARYTES; formerly called *Ponderous Earth, and Earth of ponderous Spar.*—This is an earth composed of barium and oxygen, of a greyish white colour, and having a specific gravity of about 4.000. Cold water dissolves about $\frac{1}{250}$ of it, but boiling water takes up half its weight, and the barytic salts, especially the nitrate, impart a yellow colour to burning bodies. Barytes has strong alkaline properties, is very caustic, and it is found in nature combined with carbonic or sulphuric acid.

If nitrate of barytes be exposed to a strong red heat for some time, it is decomposed, and the pure earth remains; indeed, this is the best way of preparing it in a perfectly pure state. It is also economically procured by calcining the native carbonate with charcoal, when the carbonic acid flies off in the form of carbonic oxide. After about two or three hours calcination, the whole is thrown into boiling water, by which means the barytes is

dissolved, and the solution being filtered, it is evaporated to dryness.

In consequence of the great solubility of barytes, some have classed it among the alkalies, but, as its carbonate is insoluble, it is generally called an alkaline earth.

BARYTES, ACETATE OF. A soluble salt of barytes, much used as a delicate test for sulphuric acid, which, when present in any combination whatever, is thrown down by it in the state of an insoluble sulphate of barytes.

The acetate of barytes is easily obtained by digesting the carbonate in diluted acetic acid; it can only be crystallized by spontaneous evaporation, and, when its solution is evaporated to dryness, the mass obtained deliquesces in the air.

BARYTES, CARBONATE OF; formerly called *Ponderous Aërocrate.*—This insoluble salt is found native; it is of great use in the laboratory for economically preparing the other salts of barytes, but cannot be well decomposed by heat alone.

BARYTES, HYDROCHLORATE OF. The hydrochlorate or muriate of barytes is easily procured by dissolving the carbonate in weak hydrochloric acid; it is much used as a test or re-agent for precipitating sulphuric acid from any compound, and the precipitate obtained by its use consists of sulphate of barytes.

Barytes, Muriate of. *See* BARYTES, HYDROCHLORATE OF.

BARYTES, NITRATE OF. A soluble salt, usually

formed either by dissolving the carbonate in nitric acid; or by decomposing the sulphate, by heating it with charcoal, and then treating it with nitric acid. The nitrate of barytes is decomposed by heat without addition, leaving pure barytes. (*See* BARYTES.) It detonates with combustibles, giving out a yellow light, and is much used as a precipitant for sulphuric acid.

BARYTES, SULPHATE OF; formerly called *Ponderous Spar, and Barytic Vitriol.*—The sulphate of barytes is insoluble, has a great specific gravity, and some density; hence it has been used as a permanent white in water-colours, as it is not altered by sulphuretted hydrogen. With oil it forms a sort of putty, and it is abundantly found in nature, thus forming a source of the earth. If sulphate of barytes, well mixed with $\frac{1}{8}$ of its weight of charcoal, be exposed to a strong red heat for about three hours, it is converted into a sulphuret, and, if diluted nitric acid be poured on it, a large quantity of sulphuretted hydrogen is disengaged, and a nitrate of barytes is formed, from which the pure earth may be easily obtained.

Sulphate of barytes often occurs in the analysis of sulphureous and earthy minerals, as the nitrate is much used for precipitating sulphuric acid. When a precipitate of sulphate of barytes is to be estimated, it should be well washed, and dried at a heat of 212°, when a hundred parts of it will contain about 66 of barytes, and 34 of sulphuric acid. *See* BARYTES.

Benjamin, Salt of. *See* ACID, BENZOIC.

Benzicrates. *See* BENZOATES.

BENZOATES. A class of salts formed by combining benzoic acid with alkaline bases; they are all decomposed by a red heat, but, as they are of little consequence, few of them will be noticed.

The benzoates of potass, soda, ammonia, lime, barytes, magnesia, and alumina, are soluble in water, but those of lead and iron are insoluble.

Benzoin, Acid of. Benzoin, Flowers of. *See* ACID, BENZOIC.

Bezoar, Mineral. A name formerly given to the deutoxide of antimony, or antimonious acid, because, like the animal concretion called bezoar, it was imagined to be an antidote for poisons.

BIRDLIME. Birdlime is a well known greenish substance, usually obtained by boiling the middle bark of the holly, leaving it to ferment, and afterwards macerating it in water. It is soluble in ether, sparingly so in alcohol, and insoluble in water.

BISMUTH. Bismuth is a brittle metal, of a brownish white colour, and crystalline texture; it is fused at 460°, and has a specific gravity of about 9.822. The action of the air upon it causes it to tarnish a little, but, if it be exposed to a red heat in open vessels, it burns with a faint blue flame, being at the same time converted into the oxide of bismuth, which is white. The nitric acid dissolves bismuth with great vehemence, but the sulphuric and hydrochloric acids act but feebly on it, even when concentrated and boiling. All

the solutions of bismuth have a great part of their oxide precipitated by mere dilution with water, and this precipitated oxide is sold as a cosmetic, under the name of pearl white. Bismuth, when alloyed with other metals, increases their fusibility to a great degree; hence, a large quantity of an alloy of bismuth and lead may be added to mercury, without perceptibly impairing its fluidity. Bismuth also unites with sulphur, phosphorus, iodine, and chlorine, forming compounds, as yet of no importance, and it may be obtained in a perfectly pure state by the following process. A quantity of the common bismuth is dissolved, by the assistance of heat, in a mixture of equal parts of pure nitric acid and water. When no more of the metal can be taken up by the acid, the solution obtained is to be largely diluted, and the white oxide which precipitates being washed, dried, and heated to redness, with an equal weight of black flux, will yield a button of pure bismuth.

Bismuth, Amalgam of. A compound formed by throwing bismuth into hot mercury until the whole becomes solid, on cooling; this amalgam being mixed with an equal quantity of an amalgam of lead, the two immediately become fluid at the common temperature of the atmosphere, although both were solid before mixture.

Bismuth, Ashes of. Formerly the oxide of bismuth, when prepared by heat, was known by this name.

Bismuth, Butter of. A name formerly given to

what is now called the chloride or muriate of bismuth.

Bismuth, Crystals of. An old name for the crystallized nitrate of bismuth.

Bismuth, Flowers of. *See* BISMUTH, OXIDE OF.

Bismuth, Glass of. The oxide of bismuth is fusible at a strong red heat, forming a yellowish glass, which is known by the above name.

Bismuth, Magistery of. *See* BISMUTH, OXIDE OF.

Bismuth, Muriate of. This substance being found to be a compound of chlorine, with bismuth, and not of hydrochloric (*muriatic*) acid with oxide of bismuth; it is now called chloride of bismuth. It is of no consequence, and little is known of its properties.

BISMUTH, NITRATE OF; formerly called *Crystals of Bismuth, and Bismuthic Nitre.*—This salt is easily formed by dissolving bismuth in moderately strong nitric acid, and assisting the solution by a gentle heat; when, on cooling, crystals of the nitrate will be formed. These crystals, in a dry state, are said to have the property of detonating by percussion, when well mixed with an equal weight of phosphorus; and, if put into water, a large quantity of oxide of bismuth is precipitated, and a supernitrate remains in solution.

Bismuth Ochre. An ore of bismuth consisting chiefly of the oxide.

BISMUTH, ORES OF. The ores of bismuth pro-

perly so called, are few in number. Native bismuth generally contains some cobalt or arsenic; its specific gravity is about 9, and it is often found accompanied by the ores of cobalt, nickel, &c.; there is also a native sulphuret of this metal; it is of a greyish white colour, and is rather uncommon. The native oxide of bismuth, which is also grey, is extremely rare, and is sometimes called bismuth ochre.

Bismuth, Oxide of; formerly called *Magistery of Bismuth, White of Bismuth, Pearl White, Spanish White, and Flowers of Bismuth.*—We know but one combination of bismuth with oxygen, and this may be formed by burning bismuth in open vessels, and collecting the fumes which arise. Here it must not be supposed that the oxide is volatilized, but it is in fact thrown off by the violence of the combustion which takes place. It is, however, usually prepared by mixing the nitrate with water, when a precipitate takes place, which, when calcined, is the pure oxide.

Bitumens. Mineral substances of a combustible nature, and chiefly consisting of hydrogen and carbon. Common pit-coal is a bitumen.

Blacklead. This name signifies a compound of carbon and iron, principally used in the manufacture of pencils. It is properly called a supercarburet of iron. *See* Iron, Carburets of.

Blend. A mineralogical name for a native sulphuret of zinc. *See* Zinc, Ores of.

Blood, Lixivium of. A name given to the hydrocyanate of potass, because it is prepared from blood. *See* POTASSIUM, CYANIDE OF.

Blue, Artificial Mountain. An impure carbonate of copper.

Blue, Berlin. Cyanide of iron.

Blue, Cyprian. Sulphate of copper.

Blue, Prussian. Cyanide of iron.

Blue Stone. Sulphate of copper.

BODIES, COMPOUND. A term signifying such substances as have been decomposed, and found to consist of two or more simple substances united by the force of chemical attraction.

BODIES, PHOSPHORESCENT. Such bodies as absorb light when exposed to it, and give it out again in the dark, at common temperatures, or when gently heated. Many of these substances are found in nature, as *fluor spar, diamond,* &c. but there are several artificial compositions which possess this property in a much greater degree. *See Phosphorus, Canton's.*

BODIES, SIMPLE. Simple bodies are so called, because they have not yet been decomposed; we do not presume to say that they are really elementary principles, but, as some appellations must necessarily be adopted to distinguish one class from another, those of *simple* and *compound* bodies are deemed most proper. *For a table of simple bodies, see Note 6, at the end of this volume.*

BOLETATES. Compounds of the boletic acid with salifiable bases; very few of them have ever

been formed, but, it is ascertained that the boletates of potass, soda, lime, and barytes, are soluble, while those of lead, silver, mercury, and iron, are insoluble.

Bombates. Saline compounds of the bombic acid.

Bombicrates. *See* Bombates.

Bones, Ashes of. Bones when calcined for some time in a strong open fire, leave a white ash, chiefly consisting of phosphate of lime, which is of great use in the manufacture of phosphoric acid, phosphorus, &c. *See* Lime, Phosphate of.

Boracite. A name given to a native combination of boracic acid and magnesia. It should be called borate of magnesia.

Boracites. *See* Borates.

Borates; formerly called *Boraxes and Boracites.*—Combinations of boracic acid with salifiable bases; few of them are of consequence, and they are all decomposed by most of the other acids.

The earthy borates are all insoluble in water.

Borax. *See* Soda, Subborate of.

Borax, Acid of. *See* Acid, Boracic.

Boraxes. *See* Borates.

Boron. The combustible radical of boracic acid. It is inodorous, tasteless, somewhat heavier than water, of a greenish brown colour, and is procured by heating equal weights of dry boracic acid and potassium in a glass or copper tube, and

then washing the residuum to dissolve the subborate of potass, which is formed during the operation.

Bournonite. A name given by mineralogists to a native antimonial sulphuret of lead.

Boyle's Fuming Liquor. *See* AMMONIA, HYDROSULPHURET OF.

Brass. An alloy of copper and zinc, much used in the arts.

Brimstone. *See* SULPHUR.

BRUCIA, or BRUCINE. A poisonous vegetable alkali, lately obtained from the *brucea atidysenterica.* It is crystallizable white, and sparingly soluble in water; it has a bitter taste, and, when exposed to a heat of 212°, it fuses into a substance resembling wax, but, at a strong heat, it is decomposed, being resolved into carbon, hydrogen, and oxygen. Brucia forms soluble salts with the acids.

Brown Red, English. A name given to the impure red oxide of iron, remaining in the retort after the decomposition of sulphate of iron by heat. It is used as a pigment, and is commonly called colcothar of vitriol.

C.

CABBAGE, TINCTURE OF. The blue tincture obtained from red cabbage by digesting it in proof spirit, is often used as a test for uncombined acids or alkalies; by the former it is turned red, and by the latter it is changed to green.

Cadmia Fornacum. A name formerly given to the white oxide of zinc. *See* ZINC, OXIDE OF.

CADMIUM. A metal lately discovered in an ore of zinc, and much resembling tin in its outward appearance; its specific gravity is about 8.750, and by the application of a heat somewhat lower than that required by tin, it is fused and volatilized. Cadmium forms soluble salts with acids, and it also unites with oxygen, sulphur, &c.

CADMIUM, OXIDE OF. An orange-coloured powder obtained by heating cadmium in atmospheric air. It is not volatile, and is of no use in the arts.

CAFFEIN. A vegetable principle extracted from unroasted coffee. It has a bitter taste, is yellow, and transparent like horn, and soluble in water and alcohol.

Caffein may be used as a test for iron, with which it produces a green precipitate.

Calamine. A mineralogical name for a native carbonate of zinc; it is sometimes called *lapis caliminaris.*

Calcareous. Containing lime.

Calces, Metallic. A name formerly given to those compounds of oxygen now called metallic oxides. *See* OXIDES, METALLIC.

CALCIUM. The metallic base of lime, which is found to be an oxide of calcium.

Calcium combines with chlorine, forming that substance commonly known under the name of dry muriate of lime, and it also unites with iodine,

cyanogen, and fluorine; it is of a silver white colour, and is obtained with great difficulty.

CALCIUM, CHLORIDE OF; formerly called *Muriate of Lime, Fixed Sal Ammoniac, and Calcareous Muria.*—A substance easily formed by dissolving carbonate of lime in hydrochloric acid, and evaporating to dryness, when the hydrogen of the acid combines with the oxygen of the lime, leaving a true chloride of calcium. This substance has a great affinity for water, and hence it is very useful in the laboratory for the purpose of drying gases; when it is put into water, a hydrochlorate of lime is formed, which is often used as a test for oxalic acid.

The author has often observed, that if chloride of calcium be dried at a heat approaching to redness, it loses its deliquescent property, and may be kept in contact with air for almost any length of time, but it still retains its solubility, and, if dissolved in water and recrystallized, it again becomes deliquescent.

CALCIUM, FLUORIDE OF; formerly called *Fluate of Lime, Derbyshire Spar, Blue John, and Calcareous Fluoricrate.*—A compound of calcium and fluorine, abundantly found in nature; it is sometimes used as a flux in the smelting of metallic ores, but its chief use in the laboratory consists in the formation of hydrofluoric acid. It is insoluble in water.

CALCIUM, OXIDE OF. *See* LIME.

Calculi. A name applied to all hard concretions, not bony, formed in the bodies of animals. Those found in the bladder are called urinary calculi; they generally consist of uric acid, phosphate of ammonia and magnesia, phosphate of lime, oxalate of lime, or of a substance called cistic oxide. Those concretions found in the joints of gouty persons, and generally called chalk-stones, chiefly consist of urate of ammonia.

Calomel. *See* Mercury, Chloride of.

Caloric, or *Matter of Heat.* That simple body which by its presence in an uncombined state in any substance produces the sensation of heat. Caloric, although always the same substance, is met with in two different states, viz. in a combined or latent state, and in an uncombined or free state. In the former instance it neither affects the senses nor the thermometer, but, in the latter case, it produces that sensation called heat on the human body, and also causes the mercury in the thermometer to rise.

Caloric is imponderable, and it penetrates all substances with a greater or less degree of velocity; those which are easily penetrated by it are called good conductors of caloric, and *vice versa.*

Free caloric dilates the substances into which it is introduced, and hence the hotter bodies are, the less is their specific gravity, because their bulk is increased, while their weight remains the same.

It is combined caloric which keeps substances

in a state of fluidity; and thus, when a gas becomes liquid or solid, it gives out part of its caloric, producing heat; but, when a solid becomes fluid or gaseous, it combines with the free caloric of the surrounding objects, and cold is produced. *See* MIXTURES, FREEZING.

Combined or latent caloric enters into the composition of all bodies in a greater or less quantity, according as they have more or less affinity for it.

Those substances which have the greatest affinity for caloric, are gaseous or aëriform, having combined with so large a portion of it as entirely to lose their force of cohesion; hence, in the combustion of hydrogen gas, a very large quantity of caloric is disengaged, for both it, and the oxygen with which it combines, being in the gaseous state, and combining to form water, which is a liquid, their additional quantity of caloric is given out. It is a general rule, that when a light substance becomes more dense, caloric is disengaged, but, when a dense substance becomes more fluid, it is absorbed from the surrounding objects, and cold is produced. On mixing sulphuric acid (which is a liquid) with pure potass, a great quantity of the caloric before combined with the acid, is set free, as the compound obtained assumes the solid form, having a less affinity for caloric than its component parts before mixture, but, if the potass contain much carbonic acid, this last will assume the gaseous state, and thus counteract the effect.

Caloric, in a free state, dilates all bodies by insinuating itself between their particles; hence, the cause of the mercury in a thermometer rising by the application of heat.

The unvaried inward temperature of the bodies of animals may be partly explained in the following manner. The blood is constantly absorbing oxygen from the air which we breathe, and this oxygen entering into a more dense state, gives out a great part of its caloric; but, as in summer, the air is dilated by the heat, a much less quantity of oxygen by weight is presented to the blood at each respiration, and consequently much less caloric is disengaged. In winter, the air being more dense, (that is, a larger quantity by weight being contained in a smaller space), the opposite effect is produced, and for the same reason a fire burns brighter in a frost than in a hot sun, as a larger quantity of oxygen is present to support the combustion.

Camelion Mineral. A greenish substance, formed by mixing 3 parts of nitrate of potass, and 1 of black oxide of manganese, and keeping them red-hot in a crucible as long as oxygen gas is disengaged. It received its name from the changes of colour which take place during its solution in water. *See* POTASS, MANGANESITE OF.

CAMPHOR. A concrete essential oil contained in several vegetables, but commonly obtained from a species of *laurel;* it is chiefly used in chemistry for the formation of camphoric acid.

Camphor, Acid of. *See* ACID, CAMPHORIC.

CAMPHOR, ARTIFICIAL. If hydrochloric acid gas be passed through volatile oil of turpentine (*spirits of turpentine*), after some time it will coagulate and become converted into a mass, which by sublimation yields a large quantity of camphor, and, although it is called artificial camphor, in its properties it exactly resembles that obtained in the usual way from the *laurel.*

CAMPHORATES; formerly called *Camphoricrates.*—A class of salts formed by the union of camphoric acid with alkaline bases. They are of no use in the arts, are sparingly soluble in water, and may be decomposed by a red heat.

Camphoricrates. *See* CAMPHORATES.

CANTHARADIN. A name given to the blistering matter of Spanish flies; it has a shining appearance, and is crystallizable.

CAOUTCHOUC; formerly called *Elastic Gum, and Indian Rubber.*—Caoutchouc is a very elastic substance, obtained from the juice of certain trees growing in hot countries. It may be dissolved in ether or naphtha, and, when thus treated, it forms an excellent elastic varnish for leather tubes, bladders for gases, &c. It is decomposed by the sulphuric and nitric acids, and, if set fire to, it burns with a bright flame and some smoke. There is a mineral which so much resembles this substance in all its properties, that it is called mineral caoutchouc.

CARBON. A well known substance, which in

combination with a little oxygen and hydrogen is much used under the name of charcoal. It is very abundant in nature, forming the base of all animal and vegetable substances, and it is of great use to the chemist in the reduction of metallic oxides; for, as at a high temperature, it has a greater affinity for oxygen than most of the metals, it easily deprives them of it.

Carbon is a great antiseptic, and thus, if meat be rubbed with it, putrefaction is much retarded; and putrid water, if filtered through charcoal powder, loses its offensive smell.

Carbon may be obtained nearly in a pure state by exposing white sugarcandy to a red heat in an earthenware retort; when thus procured it is black, sonorous, brittle, and perfectly unchangeable in the strongest fire if protected from the contact of air. If pure, it burns without flame when heated in atmospheric air or in oxygen gas, and during the combustion it combines with oxygen, and is converted into carbonic acid, which produces those noxious effects experienced when charcoal is burnt in close rooms. Carbon, or even common charcoal, if obtained by a strong heat, absorbs a large quantity of air and moisture during two or three days after its preparation, and the air thus absorbed is found to be solidified in its pores.

Carbon cannot be artificially crystallized, but it is met with in nature in the form of a colourless transparent crystalline substance, commonly cal-

ed diamond, (*see* DIAMOND) and in this state it is purer than any obtained by art; it unites with oxygen in two proportions, forming oxide of carbon and carbonic acid; with nitrogen it forms cyanogen, the base of the hydrocyanic acid; with sulphur it forms sulphuret of carbon; and its compounds, with hydrogen and the metals, are called carburets: it also exists combined with oxygen, hydrogen, and nitrogen, in animal and vegetable substances.

CARBON, OXIDE OF. A gaseous compound of carbon, with less oxygen than is contained in the carbonic acid; it is easily obtained by exposing a mixture of peroxide or carbonate of iron with charcoal, to a red heat in a retort, and it may be received over water, as it is not absorbed by that fluid. It burns with a lambent blue flame, forming carbonic acid, and, when mixed with oxygen gas, or atmospheric air, and set fire to, it explodes like hydrogen gas, but not with so much violence.

CARBON, SULPHURET OF; formerly called *Alcohol of sulphur*. A colourless liquid, consisting of sulphur and carbon, formed by putting some charcoal into a red-hot earthenware retort, luted to a receiver, and dropping small pieces of sulphur from time to time through the tubulation of the retort, by which means the two substances come in contact and combine. The sulphuret of carbon is a very combustible liquid, and hence its old name of alcohol of sulphur; when burnt in

the atmosphere, sulphurous and carbonic acids are formed.

Carbonates; formerly called *Aërocrates.*—Salts formed by the union of carbonic acid with different bases; they are decomposed with effervescence by almost all other acids, or by a red heat. The earthy and metallic carbonates are insoluble, but many of them may be sparingly dissolved by an excess of carbonic acid.

Carburets. Compounds of carbon with metals or other combustible substances.

Carmine. This is a colour of so much importance, and so much used by painters, that, although not purely chemical, we shall here give the method of its preparation; it is of a beautiful dazzling red colour, but, from its high price, what is found in the shops is usually adulterated.

Six pails of river water are heated in a cauldron until they begin to boil, when two pounds of powdered *cochineal* are added. The whole is made to boil for two hours; after which three ounces of nitrate of potass, and four of superoxalate of potass, are thrown in; it is made to boil ten minutes longer; when being allowed to cool, a sediment is deposited in the bottom of the vessel; the clear liquid is separated from it by means of a syphon, and is distributed into several earthen pans, which are allowed to remain quiet for three weeks; at the end of which time, a carmine of the finest quality will be found adhering to their bot-

toms; it should be dried by a gentle heat, and kept free from dust.

From the clear liquid which is poured off from the pans, a further quantity of carmine, little inferior to the first, may be obtained, by treating it with a solution of tin, which causes the precipitation of the rest of the colouring matter.

Cassius, Purple Precipitate of. A substance used as a pigment by porcelain painters; it is formed by adding a solution of tin to a solution of gold, and consists of peroxide of tin, combined with oxide of gold. It may, therefore, be called STANNATE OF GOLD.

CAST-IRON. A compound of carbon and iron, properly called carburet of iron. *See* IRON, CARBURETS OF.

Caustic, Lunar. *See* SILVER, NITRATE OF.

Cecidocrates. *See* GALLATES.

Celestine. A name in mineralogy for a native sulphate of strontian, which is of a light blue colour.

CERASIN. A vegetable principle, obtained from *gum tragacanth*, which consists almost entirely of it; it is very sparingly soluble in water, but more so in alcohol.

CERIN, or SUBERCERIN. A peculiar vegetable substance, obtained from grated cork, by digesting it in alcohol, and evaporating the solution. The name cerin is also given to that part of wax which is soluble in alcohol, and there is a mineral called by the same name.

CERIUM. A peculiar metal, found in a certain Swedish mineral, and much resembling tungsten. Very little is known of it, as it is very scarce; it is volatile at a great heat, and combines with oxygen in two proportions.

CERIUM, OXIDES OF. There are two oxides of cerium; the protoxide, which is of a white colour, and the peroxide, which is red; little or nothing is known of their properties.

Ceruse. *See* LEAD, CARBONATE OF.

Ceruse, Lemon-coloured. *See* LEAD, DEUTOXIDE OF.

CETINE. A chemical name for what is commonly called spermaceti. It consists of carbon, 81; oxygen, 6; hydrogen, 13.

Chalk. *See* LIME, CARBONATE OF.

Chalk Stones. *See* CALCULI.

Charcoal, Pure. *See* CARBON.

CHLORATES; formerly called *Hyperoxymuriates.* A class of salts formed by the combination of bases with chloric acid; their chief characteristics are, that they explode by friction or percussion, when mixed with sulphur, phosphorus, or other combustibles, and are generally soluble in water.

CHLORIDES. Combinations of chlorine with metals or other substances. A chloride of any metal, on being dissolved in water, becomes a hydrochlorate, or muriate of the oxide of the metal. This change is effected by the oxygen of the water uniting with the metal; its hydrogen, at the

same time, forming hydrochloric acid with the chlorine, and, if the solution thus obtained be evaporated to dryness, a true chloride of the metal is again formed. Thus, a chloride of calcium (formerly dry muriate of lime) being dissolved in water, a solution of hydrochlorate of lime is obtained; and, if perchloride of copper be similarly treated, a solution of perhydrochlorate of copper (that is, hydrochlorated peroxide of copper,) is the result.*

CHLORINE; formerly called *Nitromuriatic Acid, Oxymuriatic Acid, Dephlogisticated Marine Acid, and Bezoardic Spirit of Nitre.*—A simple gaseous substance, which (being obtained by distilling hydrochloric (*muriatic*) acid with half its weight of black oxide of manganese) was formerly sup-

* If, by the evaporation of hydrochlorates, crystals are obtained, which yield water when heated, these crystals consist of hydrated chlorides of the metals, and not hydrochlorates (*muriates*) of the metallic oxides; and, as it is impossible ever to prove whether the water, ready formed, or merely its component parts, exist in these salts, it seems better, for the sake of analogy, to consider all solidified hydrochlorates as chlorides.

The oxides, and some other metallic compounds, unite with water in the solid form, thereby changing their colour, and in the same manner, when chlorides absorb water, they become converted into hydrated chlorides. The protochloride of copper is an exception to this rule, for, when it absorbs water by exposure to damp air, it also absorbs oxygen, and is converted into a subperhydrochlorate, containing 2 proportionals of peroxide of copper, 1 of hydrochloric acid, and 2 of water. Perchlorides, when dissolved in water, are converted into perhydrochlorates.

posed to be a compound of the acid with oxygen, and hence its name, *oxy*muriatic acid. It has since been discovered, that the hydrochloric acid is decomposed in this operation; its hydrogen uniting with the oxygen of the manganese to form water, and its chlorine assuming the gaseous form.

Chlorine gas may be received over water, as it is but slowly absorbed by that fluid; it is of a yellowish green colour, having a suffocating odour, and entirely destroying vegetable colours; it can only be preserved in bottles, with ground-glass stoppers, and phosphorus, powdered antimony, arsenic, and some other metals, burn spontaneously in it, forming chlorides of the substances used. An aqueous solution of chlorine may be obtained either by passing the gas into a Woulf's apparatus, containing water, or by mixing weak nitric and hydrochloric acids; when prepared by this latter method, it was formerly called nitromuriatic acid. Chlorine unites with hydrogen, oxygen, nitrogen, phosphorus, sulphur, the metals, &c., and when combined with lime, it forms an excellent bleaching liquid for removing fruit and wine-stains from linen. It is the only substance which will dissolve gold and platinum, and for this reason it was formerly called *aqua regia*. It is by far the best solvent for tin and antimony, as by the use of nitric acid the metal is often converted into a peroxide without being dissolved.

Nitric acid, containing a large quantity of chlo-

rine, is often found in commerce, and it is usually sold under the name of dyer's aquafortis.

CHLORINE, DEUTOXIDE OF. A gaseous compound of chlorine and oxygen, containing more of the latter than the protoxide, but less than chloric acid.

CHLORINE, PROTOXIDE OF; formerly called *Euchlorine.* A gaseous compound of oxygen and chlorine, which explodes with violence by a gentle heat; it has a brighter colour than chlorine, and its odour resembles that of burnt sugar; it is obtained by distilling diluted hydrochloric acid with chlorate of potass, and it may be received over water. Besides the oxides of chlorine, there are also two acids, called the chloric and oxychloric acids.

CHLOROPHYLE. A name given to the green colouring matter of the leaves of plants; it has a resinous appearance, loses its green colour when mixed with chlorine or iodine, and is soluble in alcohol. When an earthy salt is decomposed in contact with chlorophyle, a sort of green lake is formed.

Choak Damp. A name given by the miners to carbonic acid gas, which is sometimes found in large quantities in coal mines. *See* ACID, CARBONIC.

CHROMATES. Compounds of chromic acid with alkaline bases. The chromate of potass is of great use in the laboratory, and the chromates of

the metals, which are insoluble, are much used as pigments.

Chrome Yellow. A name given to a yellow chromate of lead, which is used by painters.

CHROMIUM. A white brittle metal of a radiated fracture, having a specific gravity of 5.900, and requiring a most intense heat for its fusion. It is of no use in the arts except in combination, and hence the metal is seldom met with in a pure state; it combines with oxygen in three proportions, forming the protoxide, which is green; the deutoxide, which is brown, and the chromic acid, which has a scarlet colour.

Chromium also unites with chlorine, iodine, the metals, &c.

CHROMIUM, OXIDES OF. There are two oxides of chromium, namely, the protoxide, which is of a green colour, and the deutoxide, which is brown. Little is known of their properties, as they are of no use in the arts; some call the chromic acid a peroxide of chromium. *See* ACID, CHROMIC.

CICUTA. An alkaline vegetable principle, of late discovery.

CINCONIA. A peculiar alkaline vegetable principle, obtained from the pale Peruvian bark. It forms soluble salts with acids, and these salts may be used in medicine instead of the bark itself. Very little is known of its other properties.

Cinnabar. *See* MERCURY, BISULPHURET OF.

Circon. *See* ZIRCONIA.

CISTIC OXIDE. *See* OXIDE, CISTIC.

CITRATES; formerly called *Citrocrates*. Salts formed by the combination of citric acid with alkaline bases. The earthy citrates are generally insoluble.

Citrocrates. *See* CITRATES.

Clay, Pure. *See* ALUMINA.

Clyssus. An old name given to the vapour arising from the combustion of a mixture of charcoal and nitre. It chiefly consists of carbonic acid.

COBALT; formerly called *Regulus of Cobalt*.—Cobalt is a brittle metal, of a reddish grey colour, having a specific gravity of about 7.7, and requiring an intense heat for its fusion. It is attracted by the magnet, and, when melted in a crucible, and cooled slowly, it is often obtained in a crystalline form; it is also said, by Leonhardi, to possess some malleability when red-hot. It is difficult to obtain cobalt in a pure state, and hence this metal has not been sufficiently examined; it is of no use in the arts, unless in combination with some other substance, but it is soluble in nitric acid, and also unites with chlorine, oxygen, sulphur, phosphorus, and many of the metals.

The following process for obtaining pure cobalt is taken from Mr. Brande's Manual of Chemistry.

"To obtain pure cobalt, the cobalt of commerce, in fine powder, may be calcined with four parts of nitre, and washed in hot water, by which arsenic is separated: then digest in dilute nitric acid, and immerse a plate of iron, which will separate the

copper; filter, and evaporate to dryness; digest the dry mass in liquid ammonia, and filter; expel the excess of ammonia from the filtered liquor by heat, taking care not to produce a precipitate, and then add solution of potass, which throws down oxide of nickel; filter immediately, and boil, which will occasion the separation of oxide of cobalt, and which, ignited with charcoal, furnishes the pure metal. In this process, the first calcination with nitre often requires two or three repetitions, in order to get rid of the whole of the arsenic, which adheres to cobalt with much obstinacy."

COBALT, CHLORIDE OF. A compound of chlorine and cobalt, formed by digesting the metal in liquid chlorine, and evaporating to dryness; it is soluble in water, being converted into a hydrochlorated oxide of cobalt. The only use of this compound is as a sympathetic ink: if any word or sentence be written with a diluted solution of it, the writing will be invisible when cold, but will become of a beautiful blue or green colour if exposed to a gentle heat; and thus the writing may be made to disappear and reappear any number of times.

Cobalt, Muriate of. When dry, CHLORIDE OF COBALT, *but, when in solution,* HYDROCHLORATE OF COBALT. *See* COBALT, CHLORIDE OF.

COBALT, NITRATE OF. Nitrate of cobalt is a crystallizable and soluble salt, formed by dissolving the metal or its oxide in nitric acid. A concentrated solution of it is said to be a good test

for alumina; it is used by moistening the solid mineral (supposed to contain alumina) with it, and exposing it to the flame of the blowpipe; when, if much alumina be present, a blue colour is immediately produced. Zirconia is the only earth which produces the same effect, and it is easy to distinguish between the two by other tests.

Cobalt, Ores of. There are four ores of cobalt, namely, the arsenuret, the sulphuro-arsenuret or cobalt pyrites, an oxide, and an arseniate of cobalt; some say there is also a native sulphate. The two first varieties are of a brownish white colour, and have a metallic appearance, while the others are pulverulent and earthy.

The ores of cobalt usually give out an arsenical odour when exposed to heat, and impart a fine blue colour to glass when in a state of fusion.

Cobalt, Oxides of; formerly called *Calces of Cobalt.*—We have two oxides of cobalt, namely, the protoxide and the peroxide. The protoxide is of a blue colour, and may be obtained by dissolving cobalt in nitric acid, and precipitating it by a solution of potass. The precipitate, in drying, becomes black, by the absorption of a portion of oxygen, from which it may be freed by exposing it to a red heat for about half an hour, when it regains its original colour, and is converted into a true protoxide, containing about 78 per cent. of the metal. This or any other oxide of cobalt when fused for about twelve hours with a large quantity of silica, and carbonate of potass, is con-

verted into a beautiful blue glass, which, being powdered, is much used in commerce under the name of *smalts, azure*, or *zaffre*. The peroxide of cobalt is obtained by allowing the protoxide (when precipitated from the nitrate) to dry in the open air; it is of a black colour, but the proportion of its oxygen has not yet been ascertained with certainty.

Both the above oxides are soluble in ammonia, but the protoxide is the most convenient compound, whereby to estimate the quantity of cobalt contained in any ore.

Cobalt Pyrites. A native sulphuro-arsenuret of cobalt of a metallic appearance. *See* COBALT, ORES OF.

COBALT, SULPHATE OF. A combination of sulphuric acid and protoxide of cobalt, which is sometimes found native. *See* COBALT, ORES OF.

COCHINELIN or CARMINA. Names given to the colouring matter of the cochineal insect; it is red, and fusible at 120°, but, if exposed to a strong heat, it is decomposed. Cochinelin combines with alumina to form a lake, and it is soluble in water and alcohol.

Colcothar. A name given to the impure red oxide of iron, which remains in the retort, after the decomposition of the protosulphate by dry distillation.

COLUMBIUM. A rare brittle metal, of a dark grey colour. Its specific gravity is about 5.610, and it is so hard as to scratch glass; it is very in-

fusible, may be reduced to powder, and neither chlorine nor the nitric and hydrochloric acids have any effect upon it. Columbium is sometimes called tantalum; it combines with oxygen, forming the columbic acid, and the acid is found in nature in combination with iron, manganese, &c. This combination of it is called tantalite. *See Tantalite.*

COLUMBIUM, OXIDE OF. *See* ACID, COLUMBIC, which not only acts the part of an acid, but also that of a base, as it forms salts with acids as well as with alkalies.

COPPER; formerly called *Venus.*—Copper is a metal, the outward appearance of which is so well known, that it is needless to describe it. Its specific gravity, when simply fused, is 7.788, but, by beating and rolling it may be increased to about 8.878; it is very malleable, ductile, and tenacious, and in combination with zinc, it is much used by mechanics under the name of *brass.*

Copper requires a white heat to fuse it, and, if the temperature be much higher than its fusing point, it volatilizes; when heated in the air to about 300°, its surface becomes covered with a bluish or yellowish red oxide, which turns black at a red heat, and, if the metal, in the form of filings, be thrown into a strong fire, it burns with a green flame, as also when exposed to the jet of the oxyhydrogen blowpipe. It may be combined with mercury by slowly pouring melted copper into

boiling mercury; the amalgam which it forms is white, and may be decomposed by heat.

The nitric acid oxydates and dissolves copper in the cold; and, if the metal be boiled in concentrated sulphuric acid, a sulphate of copper is formed, and sulphurous acid is disengaged in abundance, but, as the acetic and hydrochloric acids cannot be decomposed by metals, copper will not combine with them unless it be at the same time in contact with air, by which means an oxide is formed, and is afterwards dissolved by the acid. The solutions of potass and soda dissolve a small quantity of copper; but ammonia has a much greater action on it, and by digesting the two substances together a solution is obtained, which is colourless when kept in a stopped bottle, but takes a fine azure blue colour when exposed to the air. Copper combines with chlorine, iodine, sulphur, and phosphorus; with oxygen it forms two definite compounds, and both its oxides unite with acids to form characteristic salts. It is a metal much used in the arts and manufactures, and, when made into saucepans, they should be kept very clean, and well tinned, as all its compounds are virulent poisons.

It may be useful to state that sugar has been very successfully used as an antidote, in cases of poisoning by the salts of copper or lead; it is only necessary to make a mixture of sugar and water, and to administer it as soon as possible after the accident.

Copper is precipitated from all its acid solutions by iron and zinc, but the best test, for very minute portions of it in any liquid, is ammonia, with which it forms a fine blue colour.

COPPER, ACETATE OF; formerly called *Distilled or Crystallized Verdigrise, and Crystals of Copper.*—A salt easily obtained by dissolving impure subacetate of copper (*common verdigrise*) in distilled vinegar, and then proceeding to evaporation and crystallization; it is very soluble, of a fine green colour, and is often used as a pigment.

Concentrated acetic acid is easily obtained from the acetate of copper by dry distillation, without addition, as the salt is easily decomposed by heat alone. When the distillation is finished, the oxide remaining in the retort may be again made into an acetate by the addition of distilled vinegar, and the water being driven off by a boiling heat, the acetic acid will be obtained at the end of the process by increasing the fire. In this manner any quantity of vinegar may be concentrated with ease, by successive distillations off the same oxide of copper.

COPPER, AMMONIO-SULPHATE OF. A compound of oxide of copper, sulphuric acid, and ammonia; it is obtained by pouring liquid ammonia into a solution of the common sulphate of copper (*blue vitriol*), until a dark-blue solution is formed, and it is sometimes used as a test for arsenic and arsenous acids. With arsenous acid it

produces a bright green precipitate, but with arsenic acid a bluish green curd is formed.

COPPER, AMMONIURET OF; formerly called *Aqua Celestis, Aqua Sapharina, and Volatile Salt of Copper.*—A compound of oxide of copper and ammonia, formed by digesting copper filings and liquid ammonia together; when exposed to air it has a fine dark azure blue colour, but, if kept stopped for an hour or two, it becomes white and limpid. It, however, regains its original hue by a fresh exposure to air, and the same changes will take place for any number of times, provided the mixture contain some particles of metallic copper. Ammoniuret of copper is crystallizable; the crystals are obtained with difficulty; they are deliquescent in the air, and are decomposed by heat.

COPPER, ARSENIATE OF. An insoluble compound, easily obtained by pouring a solution of arseniate of potass into another of sulphate of copper, when double decomposition takes place, and a bluish green precipitate of arseniate of copper is formed; it is not used in the arts, but sometimes occurs in the analysis of metallic ores, when it may be decomposed by roasting it with charcoal powder, and an oxide of copper will remain.

COPPER, ARSENITE OF; formerly called *Scheele's green.*—An insoluble yellowish green compound of arsenous acid and oxide of copper; it may be formed in a pure state by pouring a solution of arsenite of potass into another of sulphate of cop-

per, but it is usually obtained for the use of the painter by the following process:—a pound of sulphate of copper (*blue vitriol*), is dissolved in four pints of boiling water, and a solution of one pound of carbonate of potass in eight pints of water, is boiled for some time with five ounces of pulverized arsenous acid (*white arsenic*). The two solutions are now mixed while hot, and the precipitate which forms is well washed with rain-water, and dried in a warm place upon filtering paper, canvass, or flannel; it is ground up with oil when used, and produces the beautiful light-green colour so much used in painting the cabins of ships.

Copper, Ashes of. Copper, Black Oxide of. Copper, Burnt.—Names formerly given to the impure peroxide of copper, obtained by exposing the metal to a red heat with free access of air. *See* COPPER, OXIDES OF.

COPPER, CARBONATE OF. Pure carbonate of copper is obtained by adding carbonate of potass to nitrate or sulphate of copper; it is of a beautiful light-green colour, and is said to consist of peroxide of copper, 75; carbonic acid, $20\frac{7}{10}$; and water, $8\frac{5}{10}$. This salt, in an impure state, is often used as a pigment, under the name of *verditer*, and it is generally obtained from the waste nitrate of copper of the refiners, by adding to it a sufficient quantity of chalk, the lime of which unites with the nitric acid, while the carbonic acid forms *verditer* with the oxide of copper.

Carbonate of copper is found native of a blue or green colour, and the green variety is often called *malachite.*

COPPER, CHLORIDES OF; formerly called *Dried Muriates of Copper.*—There are two chlorides of copper, namely, the insoluble protochloride, which is of a yellowish or brownish colour, and is obtained by dissolving the protoxide in hydrochloric acid, and evaporating to dryness in close vessels; and the soluble perchloride, which is formed by acting on the peroxide in the same manner. This latter produces a perhydrochlorate when dissolved in water; it is of a yellow or green colour, and, at a strong heat, it is converted into a protochloride, and chlorine is disengaged.

The protochloride of copper is quite insoluble in water, but, when exposed to the air, it attracts humidity and oxygen, and becomes converted into an insoluble subperhydrochlorate; or, according to some, it is changed into a chlorided protoxide of copper. *See* CHLORIDES.

Copper, Crystals of. An old name for the crystallized acetate of copper. *See* COPPER, ACETATE OF.

Copper, Flowers of. Copper, Green. Old names for the subacetate of copper used by painters, under the name of *crude verdigrise.* *See* COPPER, SUBACETATE OF.

COPPER, HYDROCHLORATE OF; formerly called *Muriate of Copper.*—When copper is dissolved in liquid chlorine, or, when the perchloride of copper

is dissolved in water, we obtain a compound of hydrochloric acid and peroxide of copper; it is of a green colour, and, when evaporated to dryness, a perchloride of copper is formed. *See* COPPER, CHLORIDES OF.

Copper, Muriate of. *See* COPPER, HYDROCHLORATE OF.

COPPER, NITRATE OF. A deliquescent and crystallizable salt, of a greenish blue colour, easily obtained by dissolving copper in nitric acid, diluted with three times its weight of water; evaporating the solution until it becomes of a thickish consistency, and allowing it to cool in a covered vessel, when the salt will be found in the form of a green crystalline mass, which must be carefully preserved from the air, to prevent it from deliquescing. It produces a curious effect upon tin; if a piece of tin-foil, sprinkled with water, and some of this salt in coarse powder, be wrapt up suddenly into a ball, a considerable vapour and sparks of fire will issue from it. This phenomenon depends upon the decomposition of the nitrate, in consequence of the superior affinity of tin for oxygen.

COPPER, ORES OF. These ores are rather numerous, as copper occurs in nature, combined with sulphur, oxygen, chlorine, arsenic, and the metals, as well as in the state of a sulphate, a phosphate, an arseniate, and a carbonate; they are easily distinguished from the ores of other metals, by their peculiar brown or green colour; and when dissolved in acids, their solutions are always green.

33467

Bisulphuret of copper, or copper pyrites, is a yellowish metallic substance; it usually contains much iron, and sometimes has a variegated tarnish, when it is called peacock copper. The sulphate is blue, and the arseniate is green, but the native protoxide, commonly called ruby copper, is of a brownish or greyish red colour.

Native copper often occurs almost in a pure state. *For the analysis of a copper ore, see Note 4, at the end of the volume.*

COPPER, OXIDES OF; formerly called *Calces of Copper.*—There are two combinations of copper and oxygen, namely, the red protoxide, and the black peroxide; the former is obtained by dissolving a mixture of copper filings and peroxide of copper in muriatic acid, decomposing the solution by pure potass, and collecting and drying the precipitate obtained, out of the contact of air. The peroxide of copper is easily formed by heating the metal to redness in contact with air, when a crust of the oxide forms on its surface, or, if wanted very pure, it may be procured by decomposing any of the soluble salts of copper by a pure or carbonated alkali, and exposing the precipitate formed to a red heat in an open vessel. Both the above oxides are soluble in ammonia, and the solution of the protoxide is colourless, while that of the peroxide is blue.

The peroxide of copper is often very convenient in the analysis of vegetable substances; it is used for imparting oxygen to them, and thus it

enables us to effect their decomposition in close vessels; and, as heat alone does not drive off any of its oxygen, we are not liable to those mistakes which so often occur in the use of chlorate or nitrate of potass for a similar purpose. The peroxide of copper contains 80 per cent. of the metal.

COPPER, PERCHLORIDE OF; formerly called *Dry Muriate of Copper.*—A compound of copper with the largest portion of chlorine with which it can combine. *See* COPPER, CHLORIDES OF.

COPPER, PERHYDROCHLORATE OF; formerly called *Permuriate of Copper.*—A compound of peroxide of copper and hydrochloric acid. *See* COPPER, HYDROCHLORATE OF.

Copper, Permuriate of. *See* COPPER, HYDROCHLORATE OF.

COPPER, PEROXIDE OF; formerly called *Black Oxide of Copper, Burnt Copper, and Ashes of Copper.*—A compound of copper with the largest portion of oxygen. *See* COPPER, OXIDES OF.

COPPER, PHOSPHURET OF. If small pieces of phosphorus be thrown on melted copper, the two substances combine, and the compound is called by the above name; it is of no importance, and has never been applied to any use, but it much resembles the pure metal.

COPPER, PROTOCHLORIDE OF. A compound of copper with the smallest proportion of chlorine. *See* COPPER, CHLORIDES OF.

COPPER, PROTOXIDE OF; formerly called *Red*

Oxide of Copper.—That oxide of copper which contains the least oxygen. *See* COPPER, OXIDES OF.

Copper Pyrites. A mineralogical name for a native bisulphuret of copper and iron. *See* COPPER, ORES OF.

COPPER, SUBACETATE OF; formerly called *Verdigrise, Flowers of Copper, and Green Copper.*—The subacetate of copper is not of much importance to the chemist, but it is used in commerce as a pigment. It is manufactured in an impure state and in large quantities, in most wine countries, by laying plates of copper in strata with the husks of grapes, and leaving the whole in this situation for a long time. During the process, the action of the air oxydates the copper, and converts a great part of the grapes into acetic acid, which combines with the oxide formed. The subacetate of copper thus obtained, often contains tartrate of copper, and, as a pigment, it is far inferior to the arsenite.

COPPER, SULPHATE OF; formerly called *Roman Vitriol, Blue Vitriol, and Vitriol of Copper.*—Sulphate of copper is a crystallizable and soluble salt, much used by dyers, and of great importance in commerce; it is prepared by exposing native or artificial sulphuret of copper to the action of air and water; lixiviating it, and evaporating the lixivium, or, by boiling 2 parts of sulphuric acid, and 1 of copper filings or shreds, until nothing remains but a dry mass, from which the salt is ex-

tracted by solution in water. The sulphate of copper, if dried, consists of equal parts of sulphuric acid and peroxide of copper; but, when crystallized, it contains about 26 per cent. of water; it is efflorescent in the air, and may be entirely decomposed by heat. It is much used in the laboratory as a test for arsenic; for this purpose, we first saturate any acidity in the suspected liquid with ammonia, and then a crystal of the cupreous salt is introduced; by which means, if the liquid contain arsenic, a pulverulent green precipitate will be formed. The presence of ammonia in a free state is also detected by means of the sulphate of copper, with which it produces a fine blue colour.

COPPER, SULPHURETS OF. Compounds of copper, and sulphur and copper, easily formed by heating the two substances together.

If a mixture of copper filings and sulphur be heated over a spirit-lamp in a glass retort, as soon as the sulphur melts, the whole becomes red-hot, and a black sulphuret is formed. The bisulphuret is of a yellow colour, and is more commonly found in nature than the sulphuret; it is generally called copper pyrites, and is often worked for the metal. *See* COPPER, ORES OF.

Copper, Vitriol of. *See* COPPER, SULPHATE OF.

Copper; Volatile Salt of. A name given to the ammoniuret of copper, because it always gives out a smell of ammonia.

Copper, Yellow. A name sometimes given to the alloy of copper and zinc, commonly called *brass.*

Copperas, Blue. *See* COPPER, SULPHATE OF.

Copperas, Green. *See* IRON, SULPHATE OF.

Copperas, White. *See* ZINC, SULPHATE OF.

Corrosive Sublimate. *See* MERCURY, PERCHLORIDE OF.

CORUNDUM. This is a very hard mineral, consisting almost entirely of alumina; it is commonly called adamantine spar, and is sometimes used to polish the diamond. Corundum is found crystallized, its specific gravity varies from 3.9 to 4.01, and the following minerals are all species of it, varying for the most part in their outward appearance, namely, Salamstone, emery, sapphire, spinel, ceylanite, chrysoberyl, automalite, and ruby.

Cream of Tartar. *See* POTASS, BITARTRATE OF.

Crocus. An old name for the peroxide or percarbonate of iron.

Crocus Metallorum. A substance much spoken of in old chemical works; it is obtained by detonating sulphuret of antimony with nitre.

Crystals, Lunar. *See* SILVER, NITRATE OF.

Crystals, Solar. *See* GOLD, CHLORIDE OF.

CYANIDES. Compounds of cyanogen with metals, &c. The cyanides of the metals become hydrocyanated oxides when dissolved in water, and the solutions formed again become cyanides of the metals by evaporation to dryness. Thus,

if we evaporate a solution of hydrocyanate of potass to dryness, a cyanide of potassium is obtained, and this being dissolved in water, we reform hydrocyanate of potass. *See* ACIDS, HYDROGEN.

Cyanocrates. *See* CYANIDES.

CYANOGEN. A gaseous compound of carbon and nitrogen, which forms the base of the hydrocyanic or prussic acid. The compounds which it forms with metals are called cyanides, or by some cyanurets, and it may be obtained by distillation from pure cyanide of mercury.

Cyanurets. *See* CYANIDES.

Cystic Oxide. *See* OXIDE, CISTIC.

D.

DALHINE. A new vegetable substance lately discovered in the bulbs of the *dalia.* It is white, inodorous, pulverulent, tasteless, and more soluble in hot than in cold water, but insoluble in alcohol.

DAPHNIN. A vegetable principle lately discovered in the *daphne alpina.*

DATURA. A vegetable alkali obtained from the *datura stramonium.*

DELPHINIA. A new vegetable alkali obtained by a peculiar process from the seeds of the *delphinium staphysagria.* It has a bitter acrid taste, and is white; it melts when heated, and, on cooling, it becomes brittle. By a stronger heat it is

decomposed, and it is very soluble in alcohol and ether, but sparingly so in water. It forms salts with the nitric, sulphuric, and hydrochloric acids, all of which are decomposed by potass, ammonia, &c.

Dephlogisticated. A term formerly applied to those substances, which are now said to be oxydated or oxygenated. *See Phlogiston.*

Diamond. A mineral production, consisting of pure carbon. The diamond is the hardest substance known, whence it is used for cutting glass and precious stones; it was for a long time considered as an earthy substance, but, as it is found to be entirely converted into carbonic acid by the aid of oxygen and an intense heat, it is now considered to be carbon in the utmost state of purity; it is transparent, and has been found of almost all colours. The largest diamond known is said to weigh 2 oz. 169.87 grs. troy.

Diana. A name formerly given to Silver.

Diana, the Tree of. If a small quantity of mercury be put into a weak solution of nitrate of silver, in about twelve hours the silver is precipitated in an arborescent form, and, when thus precipitated, it has been called Arbor Dianæ, or the tree of Diana.

Diaphoreticum Joviale. A mixture of oxide of antimony, oxide of tin, and oxide of iron, formerly used in medicine.

E.

EARTH, Aluminous. Earth of Alumn. See ALUMINA, which is obtained from alumn.

Earth, Angelic Red. A name formerly given to the peroxide of iron. *See* IRON, OXIDES OF.

Earth, Animal. Earth of Bones. Bones, when burnt, leave a white ash, which is found to consist almost entirely of phosphate of lime. *See* LIME, PHOSPHATE OF.

Earth, Calcareous. *See* LIME.

Earth of Flints. *See* SILICA.

Earth, Foliated, of Tartar. A name formerly given to the acetate of potass.

Earth, Magnesian. Earth, Muriatic. *See* MAGNESIA.

Earth, Ponderous. *See* BARYTES, which is a very heavy earth.

Earth, Ponderous, Aëriated. *See* BARYTES, CARBONATE OF.

Earth, Ponderous, Nitrated. *See* BARYTES, NITRATE OF.

EARTHS. A class of bodies formerly supposed to be simple substances. They are principally characterised by very limited solubility in water, and being quite insoluble when combined with carbonic acid; they are all of a whitish colour, some of them possessing strong alkaline properties.

The earths are found to be combinations of

oxygen with metallic bases, which bases sometimes combine with oxygen in two proportions.

The alkaline earths are,	Barytes	or, *Protoxide of Barium.*
	Strontia	or, *Oxide of Strontium.*
	Lime	or, *Oxide of Calcium.*
	Magnesia	or, *Oxide of Magnesium.*
Besides these, we have,	Silica	or, *Oxide of Silicum.*
	Alumina	or, *Oxide of Aluminum.*
	Zirconia	or, *Oxide of Zirconium.*
	Glucina	or, *Oxide of Glucinum.*
	Yttria	or, *Oxide of Yttrium.*
	Thorina	or, *Oxide of Thorinum.*

Earths, Metallic. *See* OXIDES, METALLIC.

ELAIN. The oily principle of tallow and other fats which consist of elain and stearine. Elain is prepared from tallow, by dissolving it in hot alcohol, and separating the stearine by crystallization, and the elain by evaporation. It remains fluid at 60°, and is generally of a white or whitish yellow colour.

Elastic Gum. *See* CAOUTCHOUC.

Electricity. *See* FLUID, ELECTRIC.

Electrocrates. *See* SUCCINATES, *and Acid; Electrine.*

Emetic, Tartar. *See* POTASS AND ANTIMONY, TARTRATE OF.

EMETIN. The poisonous active principle of *ipecacuanha root.* It is soluble in water and alcohol, insoluble in ether, uncrystallizable, and of a brownish red colour.

Ens-Veneris. A name formerly given to a hy-

drochlorate of ammonia and copper, which is of a beautiful green colour.

Epimurias. *See* HYDROCHLORATES.

Epoxicrates. *See* ACETATES.

Epsom Salt. *See* MAGNESIA, SULPHATE OF.

ESCULINE. An alkaline vegetable principle, lately obtained from the *horse-chesnut.* It is of a yellowish colour, having a sweetish pungent taste, and it is soluble in alcohol and ether.

Essences. *See* OILS, VOLATILE.

ETHER, SULPHURIC, NITRIC, &c. *See* ETHERS.

ETHERS; formerly called *Dulcified Acids, and Vegetable Naphthas.*—By the action of acids on alcohol, very volatile fluids are obtained, which take the names of the acids by which they are formed; thus, by distilling equal parts of diluted nitric acid and alcohol at a very gentle heat we obtain a fluid called nitric ether; but, if an equal weight of concentrated sulphuric acid is used, the product is called sulphuric ether. In the manufacture of this latter, the following precautions are necessary: 1st, That the distillation be performed in a glass retort set in a sand-bath; 2nd, That the mixture be raised to the boiling point as quickly as possible; 3rd, That the receiver be kept cool; and lastly, that the operation be suspended as soon as white vapours of sulphurous acid begin to appear.

Besides the ethers abovementioned, we have muriatic or hydrochloric ether, formed by distilling equal bulks of strong hydrochloric acid and al-

cohol, hydriodic ether procured in the same manner by using hydriodic acid, as well as acetic; benzoic, oxalic, citric, and tartaric ethers; but it is necessary in obtaining any of those formed by vegetable acids, to add some sulphuric acid to the mixture, as otherwise no ether could be disengaged.

Notwithstanding the difference of the acids used in the distillation of ethers, they much resemble each other in their properties; they are very volatile, have a small specific gravity, a fragrant odour, and are sparingly soluble in water; hence, they are usually purified by distillation at a low heat, or washing with an aqueous solution of potass, which deprives them of any acid they may contain. Ether dissolves volatile oils, resins, extractive matter, &c.; and, if mixed with hydrochlorate of gold, the salt is decomposed, and the ether floats on the surface, holding the metal in solution. It burns with a brighter flame than alcohol, boils at a very low temperature, freezes at 46 below zero, and dissolves a small quantity of sulphur; it is often used in medicine, and under the air-pump it boils at common temperatures, at the same time producing intense cold.

The etherial solution of sulphur is recommended as a test for lead, with which it produces a black precipitate.

Ethiops, Martial. Protoxide of iron. *See* Iron, Oxides of.

Ethiops, Mineral. Ethiops, per se. Protoxide of mercury is called ethiops per se, because it may be formed merely by agitating mercury in atmospheric air.

Euchlorine. *See* CHLORINE, PROTOXIDE OF.

Extract of Saturn, Goulards. *See* LEAD, SUB-ACETATE OF.

Extracts. Thick vegetable pastes, obtained from plants, by infusing them in water, and evaporating the fluid almost to dryness by means of a water-bath.

F.

FARINA; commonly called *Starch;* formerly *Amilaceous Matter.*—A well known substance of vegetable origin, the solution of which is used as a test for iodine, with which it always gives a blue precipitate.

FERROCYANATES. *See* FERROHYDROCYANATES.

FERROCYANIDES. Compounds of cyanogen and iron with metals; they are obtained by evaporating ferrohydrocyanates to dryness.

FERROHYDROCYANATES; also called *Ferrocyanates and Ferroprussiates.*—When solutions of alkalies or earths are boiled, or digested with cyanide of iron (*prussian blue*), we obtain a hydrocyanate of the alkali used, but some iron is also taken up, and cannot be separated from the salt even by crystallization; and, as the metal is supposed to form a part of the acid, the salt thus obtained is

called a ferrohydrocyanate. They become converted into ferrocyanides when evaporated to dryness or crystallized, and they are very much used as tests for metals which they precipitate of the following colours:

Iron	proto-salts, *white.*	Bismuth	*white.*
	per-salts *blue.*	Mercury	*yellowish white.*
Nickel	*white.*	Silver	*white.*
Cobalt	*brown yellow.*	Gold	*yellowish white.*
Manganese	*white.*	Palladium	*orange.*
Cerium	*white.*	Arsenic	*white.*
Uranium	*brown red.*	Antimony	*white.*
Zinc	*white.*	Chromium	*green.*
Cadmium	*white.*	Molybdenum	*brown.*
Lead	*white.*	Columbium	*olive.*
Tin	*white.*	Titanium	*green.*
Copper	*brown.*		

FIBRIN. A fibrous substance, giving strength to animal and vegetable bodies, from which it may easily be obtained by digesting them in hot water, and then in hot alcohol. The fibrin obtained from vegetable substances is sometimes called lignin.

Fire Damp. Carburetted hydrogen gas often occurs in large quantities in coal-mines, when it is called fire-damp by the miners, because of its great combustibility.

Flake, White. A name formerly given to the oxide of bismuth, formed by putting the nitrate into water. It obtained this name from its flaky appearance when suspended in water. *See* BISMUTH, OXIDE OF.

Flint, Earth of. Flint, Pure. *See* SILICA.

Flores Calendulæ Minerales. A hydrochlorate of ammonia containing iron.

Flowers. Solid substances reduced to powder by sublimation or chemical action.

Flowers of Amber. *See* ACID, SUCCINIC.

Flowers of Benzoin. *See* ACID, BENZOIC.

Flowers, Metallic. *See* OXIDES, METALLIC.

Flowers of Sulphur. *See Sulphur, Flowers of.*

Fluates. *See* HYDROFLUATES *and* FLUORIDES.

FLUID, ELECTRIC. With regard to the cause of electric phenomena we know but little; they are generally said to arise from a certain subtile fluid contained in all substances, and brought into activity by friction or some chemical action, as in the galvanic pile. But, our object here being chemistry, it will be sufficient to mention those properties of electricity which are connected with that science.

Electricity exists in bodies in two states, viz. positive and negative, and these two attract each other. If two bodies be endued with the same sort of electricity, they repel each other, but, if their electricities be opposite, they are mutually attracted, and from this arises chemical affinity. When this equilibrium is destroyed, the compound acted upon is decomposed, as in the use of the galvanic pile, by which water is resolved into oxygen and hydrogen gases. The electric fluid, like caloric, is conducted with different degrees

of velocity by different substances, while some entirely stop its course.

The following is a table of the best *conductors* and *non-conductors* of electricity; they are arranged according to their excellency, the first in the list being the best.

Conductors of Electricity or Non-Electrics.

Gold.	Charcoal from all substances.
Silver.	The fluids of any animal body.
Copper.	Salt water, fresh water, and all non-elastic fluids, except fixed oils.
Platina.	
Brass.	
Iron.	Ice and snow, till cooled down 13° of Fahrenheit's thermometer; below this temperature, Achard of Berlin found that they became electrics.
Tin.	
Mercury.	
Lead.	
Semi-metals and metallic ores.	Most saline substances, of which the metallic salts are the best.
Blacklead, or supercarburet of iron.	

Non-Conductors or Electrics.

All vitrifications and resins, &c.	Smoke.
Earthy substances.	The vapour of hot water.

Fluoricrates. Fluors. *See* HYDROFLUATES *and* FLUORIDES.

FLUORIDES; formerly called *Dry Fluates.*—Compounds of fluorine with the metals or the metallic bases of the earths and alkalies; they are easily formed by adding hydrofluoric acid to the alkalies, &c., and evaporating to dryness, when the hydrogen of the acid unites with the oxygen of the alkali, forming water, and leaving a fluoride of the

metallic base of the alkali used. The soluble fluorides, when dissolved in water, form hydrofluates; they all yield hydrofluoric acid when distilled with sulphuric acid in silver or leaden vessels, but, if similarly decomposed in retorts of glass or stone-ware, fluosilicic acid is obtained.

FLUORINE. The substance which by its combination with hydrogen forms the hydrofluoric acid, commonly called the fluoric acid.

FLUXES. Saline substances used to facilitate the fusion of other bodies.

Black flux is formed by detonating together 1 part of nitre, and 2 parts of supertartrate of potass. The white flux is formed by detonating 3 parts of nitre, and 1 of supertartrate of potass, and the raw flux is merely a mixture of these two substances in various proportions. *For the manner of using fluxes in the reduction of metallic oxides, see Note 2, at the end of this volume.*

FUNGATES. Saline compounds of the fungic acid. The fungates of potass, soda, ammonia, lime, barytes, and magnesia, are soluble, but those of lead and silver are insoluble.

FUNGIN. A peculiar vegetable substance of late discovery. It is obtained from the fleshy part of mushrooms, in the same manner as fibrin is obtained from wood, &c. *See* FIBRIN.

G.

GALACTOCRATES. See LACTATES, *and Acid, Galactic.*

Galamelicrates. *See* MUCATES, *and Acid, Galamelic.*

Galena. An ore of lead chiefly consisting of sulphuret of lead, but also containing a variable quantity of arsenic. *See* LEAD, ORES OF.

GALLATES; formerly called *Cecidocrates.* Compounds of the gallic acid with alkalies, earths, &c.; they are of no consequence in the arts, but may be used for precipitating metals, as the metallic gallates are insoluble. The gallates are generally of limited solubility in water, and when the gallic acid is combined with tannin, as in tincture of galls, it precipitates almost all the metals without the intervention of an alkaline base. *See* GALLS, TINCTURE OF.

Galls, Acid of. *See* ACID, GALLIC.

GALLS, TINCTURE OF. This tincture is made by infusing nut-galls in a mixture of alcohol and water; it is much used as a test for metals in solution, which it precipitates as follows:

Iron	per-salts . *black.*	Cobalt . .	*whitish yellow.*
	proto-salts . *none.*	Manganese .	*white.*
Nickel . . .	*whitish grey.*	Cerium . .	*brownish red.*
Uranium .	*chocolate coloured.*	Chromium .	*brown.*
Lead . . .	*white.*	Molybdenum	*dark brown.*
Copper . . .	*brown.*	Tellurium . .	*yellow.*
Bismuth . .	*yellow.*	Columbium .	*orange.*
Mercury . .	*deep yellow.*	Titanium . .	*brownish red.*
Silver . .	*yellowish brown.*	Osmium .	*dark blue or purple.*
Gold	*green.*		
Antimony .	*white.*		

GAS; formerly called *Air.*—A generic term for

all those bodies which have their particles so far separated by combination with caloric as entirely to lose their force of cohesion, and to remain in the aëriform state at common temperatures and pressures.

Gas, Aëroxic. An old name for carbonic acid gas. *See* Acid, Carbonic.

Gas, Ammoniacal; formerly called *Alkaline or Urinous Air.*—Ammonia, in its simplest form, and at common temperatures and pressures, when out of the reach of water, is always gaseous; but it has lately been condensed into the liquid form by cold and great pressure. *See* Ammonia.

Gas, Arsenuretted Hydrogen. A very noxious aëriform fluid obtained by boiling an alloy of 3 parts of tin, and 1 of arsenic, in hydrochloric acid, when the gas disengaged may be received over water. It is much heavier than pure hydrogen gas, but lighter than atmospheric air, has a fetid smell, burns with a bluish white flame in common air, and, if mixed with a little strong nitric acid, combustion, decomposition, and explosion, immediately take place. When burnt in oxygen gas it produces a blue flame of great splendour, but, if the two be mixed and set fire to, a violent explosion takes place. Arsenuretted hydrogen gas, when burnt in atmospheric air, deposits a white compound of arsenic, with a small quantity of hydrogen, and this compound is called *hydruret of arsenic.*

Gas, Carbonaceous. See GAS, CARBURETTED HYDROGEN.

GAS, CARBURETTED HYDROGEN; formerly called *Heavy Inflammable Air, and Carbonaceous Gas.*—When equal weights of sulphuric acid and alcohol are distilled together at a strong heat, a large quantity of this gas comes over. When simply mixed with chlorine gas, it forms with it a sort of oil, (hence its name olefiant gas); but, when the mixture is burnt, hydrochloric acid is formed, and a large quantity of carbon is precipitated.

Carburetted hydrogen may be preserved over water; it burns in the atmosphere with much light, and some smoke, both of which are produced by the carbon which it contains; and it is observed, that the more hydrogen gas is carburetted, the greater is its specific gravity, and the less the bulk of it required to burn a given length of time.

Hydrogen more or less carburetted often occurs in coal-mines, when it is called by the miners *fire-damp*, and in these cases, as it is always mixed with atmospheric air, it explodes whenever a candle is introduced. To obviate this, it was that Sir H. Davy invented the safety-lamp, but, from the stupidity and wilfulness of the workmen it is not generally used, and, in consequence, accidents often occur. Oil and coal-gases are both impure carburetted hydrogen.

GAS, CHLORINE. Chlorine under common cir-

cumstances is gaseous, but, by pressure or cold, it may be liquefied, or even solidified if it contain water. *See* CHLORINE.

Gas, Hepatic. *See* GAS, SULPHURETTED HYDROGEN.

GAS, HYDROGEN; formerly called *Inflammable Air or Gas.*—A combustible and aëriform compound of caloric and hydrogen, easily procured by pouring diluted sulphuric acid on iron filings, or granulated zinc; it may be received over water, as it is not absorbed by that fluid, and it is the lightest substance known, being only $\frac{1}{13}$th as heavy as the atmospheric air.

Hydrogen gas combines with phosphorus, sulphur, carbon, &c. *See* GAS, PHOSPHORETTED HYDROGEN, &c.

Gas, Mephitic. *See* GAS, NITROGEN.

GAS, NITROGEN; formerly called *Mephitic Gas or Air, and Phlogisticated Air.*—The substance nitrogen, like many other simple bodies, can never be deprived of a sufficient quantity of caloric, to make it assume the solid or liquid form; hence, it always appears in the aëriform state, unless it be solidified by combination with other substances.

Nitrogen gas forms about $\frac{4}{5}$ths of our atmosphere, and hence it is easily obtained from it by inverting a glass bell of common air in a saucer containing a solution of sulphuret of potass, which absorbs the oxygen. It neither supports combustion or respiration, and has no very striking properties.

Gas, Nitrous. *See* NITROGEN, PEROXIDE OF.

Gas, Olefiant. *See* GAS, CARBURETTED HYDROGEN, which forms an oil when mixed with chlorine.

GAS, OXYGEN; formerly called *Vital Air, Dephlogisticated Air, Pure Air, and Fire Air.*—This is a compound of the simple substance called oxygen, with caloric; it is easily obtained by heating the black peroxide of manganese to redness in a retort, when oxygen gas is evolved in abundance, the manganese at the same time being converted into a deutoxide. Nitre and the red deutoxide of lead, when similarly treated, also afford this gas, but it is obtained with the greatest ease by putting chlorate of potass into a retort, and applying the heat of a lamp, when a large quantity of very pure oxygen gas is disengaged.

Oxygen gas makes about $\frac{1}{5}$th part of our atmosphere, and it is by this, that animal life and all common combustions are supported. When a body is burned in oxygen gas, it in the first instance contains light, while the oxygen is combined with a large quantity of caloric, which keeps it in the gaseous state; when the temperature of the combustible is raised, it unites with the base of the oxygen gas, at the same time giving out its light, while the oxygen parts with its caloric of fluidity, and these two substances thus disengaged, form what is called fire. Hence, the more oxygen a substance combines with in combustion, and the denser the compound which it forms with

it, the larger the quantity of caloric which is disengaged.

If a coil of iron-wire, with a small piece of lighted charcoal attached to it, be suspended in oxygen gas, the charcoal is rapidly consumed, after which the iron takes fire and burns, letting fall globules of a black substance, which is a combination of oxygen in the solid state with iron; if the wire be previously weighed, it will be found that the black substance formed surpasses in weight the iron consumed, exactly by the weight of the oxygen gas which has disappeared, thus proving that it is really a compound of the ponderable base of oxygen gas with iron. *See* OXYGEN.

Gas, Oxymuriatic Acid. *See* GAS, CHLORINE.

Gas, Phosgene. *See* ACID, CHLOROCARBONIC.

GAS, PHOSPHURETTED HYDROGEN. A gaseous compound of phosphorus and hydrogen, obtained by boiling a little phosphorus, potass, and water together in a retort. It burns spontaneously in atmospheric air, and oxygen or chlorine gases, but it throws down part of its phosphorus if long kept.

Gas, Prussic. A name given to cyanogen, which is gaseous at common temperatures. *See* CYANOGEN.

Gas, Silicated Fluoric. A very heavy gas, consisting of fluorine and silicum; as it has strong acid properties, it is called fluosilicic acid. *See* ACID, FLUOSILICIC.

GAS, SULPHURETTED HYDROGEN; formerly call-

ed *Sulphurous Alkaline Air, Hepatic Gas, and Hepatic Air.*—A very combustible compound of hydrogen and sulphur, obtained by pouring weak hydrochloric acid on an earthy or metallic sulphuret; it burns with a blue flame, water and sulphurous acid being formed, and a large quantity of sulphur being precipitated.

If a little strong nitric acid be poured into a flask, full of this gas, the acid is decomposed, and combustion ensues. Sulphuretted hydrogen gas has a fetid smell, resembling rotten eggs; it has been condensed into the liquid form, and is slowly absorbed by water, when the solution obtained is used as a test for metals; whenever animal matter of any kind undergoes spontaneous decomposition, a large quantity of it is disengaged, and it is in consequence of this that the white lead of drawings so often becomes black in large cities. *See* HYDROGEN, SULPHURETTED.

GAS, SULPHUROUS ACID. Sulphurous acid, at common temperatures and pressures, when out of the reach of water, is always gaseous, but, by cold or pressure it may be condensed into the liquid state. *See* ACID, SULPHUROUS.

GELATINE; commonly called *Jelly or Gelly.*—An animal substance, soluble in hot and cold water, and consisting of oxygen, hydrogen, nitrogen, and carbon. It is precipitated from its solutions by tannin, in the form of a brown insoluble compound of the two substances, and on this circum-

stance depends the tanning of leather, as the gelatine of the skins combines with the tannin of the oak-bark used.

Glass, Animal. *See Glass, Phosphoric.*

Glass Gall. *See Sandiver.*

Glass, Phosphoric. Fused phosphoric acid, containing biphosphate and sulphate of lime; it is used for obtaining phosphorus. *See* ACID, PHOSPHORIC.

Glass of Saturn. Fused protoxide of lead.

Glass of Venus. Fused oxide of copper.

Glass-Maker's Soap. Peroxide of manganese, which obtained this name, because it is used for rendering glass clear.

GLIADINE. A peculiar vegetable principle, obtained from the gluten of wheat, by digesting it in alcohol, and leaving the solution to spontaneous evaporation. Gliadine is precipitated from its alcoholic solution by water; it is of a yellowish colour, has a sweet taste, and its other properties much resemble those of resins.

GLUCINA. A very scarce earth, composed of glucinum and oxygen, and combining with acids to form salts of a sweetish taste; it is of a white colour, and adheres to the tongue like alumina.

GLUCINUM. The base of glucina, which is a compound of it and oxygen. Glucinum is supposed to be of a metallic nature.

GLUCIUM. *See* GLUCINUM.

Glue or Jelly. *See* GELATINE.

GLUTEN. A substance found in vegetables,

and consisting of oxygen, hydrogen, carbon, and nitrogen. It may be obtained from wheat-dough, by kneading it in a running stream of water, when the other parts are carried away, and the gluten remains in the hand. It is ductile and tenacious, and it putrifies like an animal substance when exposed to air. Gluten consists of two vegetable principles, namely, GLIADINE and ZIMOME.

GOLD. A malleable metal, of a yellowish red colour, having a specific gravity of 19.300, and not being oxydizable by the heat of a furnace, or by the air of the atmosphere; it may, however, be oxydized by electricity, or by the flame of the oxyhydrogen blow-pipe. Gold is fused at a heat of 1300° of Fahr., and in this state it has a dark-green colour, as also when it is beat out into thin leaves; if melted with sulphuret of potass it is acted upon by it, and the whole is afterwards soluble in water, but chlorine is the only liquid which dissolves gold; it forms with it a hydrochlorate, and, if this solution be evaporated to dryness, a chloride of gold is obtained. Gold unites with oxygen and many of the metals, and an alloy of copper and gold is used for making coin.

It may be purified from any mixture of the base metals by melting it with nitre, or by cupellation with lead, (*see Note* 3, *at the end of this volume*); and it may also be procured in a pure state by the humid way. A quantity of gold is dissolved in a mixture of nitric and hydrochloric acids; the solution is filtered, and protosulphate of iron is

poured into it, which in a short time precipitates all the gold in the metallic state, leaving the other metals in solution.

Gold is obtained from the sand of many rivers by washing, but, if it be interspersed with much stony matter, it is calcined, pounded, washed, and amalgamated with mercury, and the amalgam formed being exposed to a red heat, the mercury is driven off, and the gold is obtained nearly in a pure state.

The manner of separating silver from gold differs according to the proportion which the two metals bear to each other; the operation is called parting, and is performed in the following manner:

When a small quantity of gold is contained in a large quantity of silver, the whole is granulated and digested in nitric acid, perfectly free from chlorine, when the silver is dissolved, and the gold remains behind in the form of a black powder; but, if the gold predominates, the alloy is boiled in a mixture of nitric and hydrochloric acids, which, (by virtue of its chlorine) dissolves the gold, and leaves the silver in the form of a white, insoluble chloride, which may be reduced to the metallic state by fusing it with an equal weight of carbonate of potass.

The uses of gold are well known to every body; it is a very malleable and ductile metal, easily combines with mercury, and, as it is not acted upon by common re-agents, it is recommended,

for the formation of spoons, to contain saline substances, when exposed to the flame of the blowpipe.

GOLD, AMALGAM OF. A compound of mercury and gold, formed by heating these substances together. It is used for gilding metals, by rubbing them with it, and then driving off the mercury by heat.

GOLD, AMMONIURET OF; also called *Fulminating Gold.*—A compound of ammonia and oxide of gold, formed by pouring ammonia into hydrochlorate of gold; it is insoluble in water, of a brown colour, and possesses dangerous properties. It is commonly called fulminating gold, as it explodes violently by friction, or by the application of a very gentle heat.

GOLD, CHLORIDE OF; formerly called *Dry Muriate of Gold, and Crystals of Gold.*—A compound formed by dissolving gold in liquid chlorine, and evaporating to dryness; when dissolved in water, it becomes a hydrochlorated oxide of gold. The hydrochlorate thus obtained is much used as a test for the proto-salts of tin, with which it invariably produces a purple precipitate of stannate of gold.

This precipitate is commonly called *purple precipitate of Cassius.*

GOLD, ETHERIAL. If ether be poured into a solution of gold, it takes up the metal, and the etherial gold, or auriferous ether, floats on the surface of the chlorine, which was before combined

with the gold. It is sometimes used for gilding iron.

Gold, Fulminating. *See* GOLD, AMMONIURET OF.

Gold, Mosaic. *See Aurum Musivum.*

Gold, Muriate of. *See* GOLD, CHLORIDE OF.

GOLD, OXIDES OF. Gold is susceptible of two degrees of oxydation, forming the purple and the yellow oxide of gold, neither of these are of any use.

Gold, Pigment. *See* GOLD, STANNATE OF.

Gold, Potable. A solution of gold in hydrosulphuret of potass. *See* GOLD.

GOLD, STANNATE OF; formerly called *Gold Pigment, Purple Precipitate of Cassius, and Mineral Purple.*—This is an insoluble purple compound of oxide of gold, and peroxide of tin, formed by adding a solution of gold to any of the proto-salts of tin, and, as the peroxide here mentioned is sometimes named stannic acid, this compound of it is called by the above name; it is used as a pigment by porcelain painters, but the proportions of its component parts often vary.

Graphites. An old name for the native supercarburet of iron. *See* IRON, CARBURETS OF.

Green, Brunswick. A tartrate of potass and copper.

Green, Mineral. Scheele's Green. An arsenite of copper formed by boiling sulphate of copper, carbonate of potass, and arsenous acid together. *See* COPPER, ARSENITE OF.

Gum. *See* MUCILAGE.

Gum, Elastic. *See* CAOUTCHOUC.

Gummicrates. *See* MUCATES.

Gypsum, or Gyps. A native sulphate of lime. *See* LIME, SULPHATE OF.

H.

HÆMATITES. An ore of iron, consisting of the metal combined with oxygen. It is of a brownish red colour, and is sometimes called kidney iron ore.

Hartshorn. A common name for a weak solution of ammonia, which is obtained by the dry distillation of hartshorn shavings.

Halonatron. *See* SODA, CARBONATE OF, which, when found native, has been called by this name.

HEMATIN. A name given to the colouring principle of logwood.

Hepars. A name given to the sulphurets, signifying liver, because they resemble that substance in colour.

Hepars, Saline. Sulphuretted potass or soda.

Horn Lead. *See* LEAD, CHLORIDE OF, which resembles horn.

Horn Mercury. Chloride of mercury.

Horn Moon. *Horn Silver.* Chloride of silver, which resembles horn.

Hot Short. A peculiar kind of iron which is malleable when cold, but brittle when hot.

Hutten-nicht. An old German name for the white oxide of zinc.

HYDRATES. Compounds of water with alkalies, earths, metallic oxides, chlorides, salts, &c.

HYDRIODATES. Compounds of hydriodic acid with alkalies, earths, and metallic oxides; they can only be preserved in solution, because, when dried, the oxygen of the alkali or oxide unites with the hydrogen of the acid, forming water, and leaving an iodide of the metallic base of the alkali.

HYDROCHLORATES; formerly called *Muriates and Murias.*—Salts formed by the combination of hydrochloric acid with alkalies, earths, or metallic oxides; they can only exist in solution, for the reasons of which, *see* ACIDS, HYDROGEN; and when they are crystallized by evaporation, they are no longer hydrochlorates of the alkalies, but chlorides or (if the crystals contain water) hydrated chlorides of the metallic bases of the alkalies.

HYDROCYANATES; formerly called *Prussiates and Cyanocrates.*—Compounds of hydrocyanic acid with alkalies, which, for the same reasons as the other salts of the hydrogen acids, can only exist in solution.

When the hydrocyanates are prepared by digesting solutions of alkalies upon cyanide of iron, (*prussian blue*), they always contain some protoxide of iron, from which it is very difficult to free them, and, whenever a hydrocyanate (*prus-*

siate), is crystallized, it becomes converted into a hydrated cyanide. *See* ACIDS, HYDROGEN.

Precipitates are obtained from many of the metals by means of solutions of the hydrocyanates, and many of these precipitates materially differ in colour from those obtained by the use of the ferro-hydrocyanates, commonly called *ferroprussiates.*

The following is a table of the colours of the precipitates which different metals give with the pure hydrocyanates.

Manganese	*dirty yellow.*	Copper { proto-salts	*white.*
Iron { proto-salts	*white.*	Copper { per-salts	*yellow.*
Iron { per-salts	*blue.*	Nickel	*yellowish white.*
Tin	*white.*	Mercury	*yellow.*
Zinc	*white.*	Silver	*white.*
Antimony	*white.*	Gold	*white, changing to yellow.*
Uranium	*yellow.*		
Bismuth	*white.*		

HYDROFLUATES; formerly called *Fluates, Fluoricrates.*—Saline compounds of hydrofluoric acid with earths, alkalies, or metallic oxides, which, for reasons stated under the head ACIDS, HYDROGEN, can only exist in solution.

If any hydrofluate (in solution) be evaporated to dryness, or crystallized, it will no longer be a hydrofluate, but, in the first case, a pure fluoride, and in the second, a hydrated fluoride will result.

HYDROGEN. That simple body which, by its combination with a large quantity of caloric, and a small quantity of light, forms hydrogen gas. Hydrogen, by its combination with oxygen, forms

water; it combines with several bases, forming acids, and it also unites with carbon, sulphur, arsenic, and tellurium. *See* GAS, HYDROGEN, &c.

HYDROGEN, ARSENURETTED. A gaseous compound of arsenic and hydrogen. *See* GAS, ARSENURETTED HYDROGEN.

HYDROGEN, CARBURETTED. A compound of carbon and hydrogen, which is always gaseous. *See* GAS, CARBURETTED HYDROGEN.

HYDROGEN, SULPHURETTED. A compound of sulphur and hydrogen, which unites with alkaline bases, but which, when disengaged from them, appears in the gaseous state.

Sulphuretted hydrogen is, however, soluble in water, and its solution is an excellent test for metallic salts.

The following is a table of the colours of the precipitates formed with different metals.

Iron . . .	*black.*	Mercury . .	*black.*
Nickel . .	*greyish white.*	Silver . . .	*black.*
Cobalt . .	*white.*	Gold . . .	*black.*
Manganese .	*white.*	Platinum . .	*black.*
Cerium . .	*brown.*	Palladium .	*deep brown.*
Uranium .	*brownish yellow.*	Arsenic . .	*yellow.*
Zinc . . .	*yellowish white.*	Antimony .	*orange.*
Cadmium .	*yellowish white.*	Molybdenum	*brown.*
Lead . . .	*black.*	Tellurium .	*blackish.*
Tin . . .	*brown.*	Columbium .	*chocolate.*
Copper . .	*black.*	Titanium .	*light green.*
Bismuth . .	*deep brown.*		

For the properties of sulphuretted hydrogen gas, see GAS, SULPHURETTED HYDROGEN.

HYDROGEN SUPERSULPHURETTED. A compound of hydrogen with more sulphur than is contained in sulphuretted hydrogen.

HYDROGEN, TELLURETTED. An uninteresting compound of hydrogen and tellurium, which is always gaseous. *See* ACID, HYDROTELLUROUS.

HYDROGURETTED SULPHURETS. *See* SULPHURETS, HYDROGURETTED.

HYDROSULPHURETS. Compounds of sulphuretted hydrogen with alkaline bases, which are generally soluble in water; their solutions form good tests for the metals, by virtue of the sulphuretted hydrogen which they contain. *For a table of the precipitates given by different metals with sulphuretted hydrogen, see* HYDROGEN, SULPHURETTED.

HYOSCIAMA. An alkaline vegetable principle, lately discovered by Dr. Brandes in the *hyosciama nigra, or henbane.* It crystallizes in prisms, and forms salts with the sulphuric and nitric acids.

I.

JALAPIN. A vegetable principle lately discovered in *jalap.*

INDIGO. A blue coloured dye drug, extracted from a plant of the same name; it is with this substance that dark-blue cloth is dyed.

INDIGO, SULPHATE OF. A solution of indigo in sulphuric acid, with which the carbonates of potass or soda give a fine blue precipitate.

INULIN. A vegetable substance, in the form

of a white powder, which is insoluble in alcohol and cold water, but soluble in boiling water.

Iodides. Compounds of iodine with metals, &c., which, when dissolved in water, become hydriodates of the oxides of the metals used; the iodides are generally insoluble in water.

Iodine. A grey crystalline substance, of a specific gravity of 1.7, having a slight metallic lustre, and much resembling powdered sulphuret of antimony; it is slightly soluble in water, but very soluble in alcohol; and its vapour, which is of a beautiful violet colour, supports combustion in several substances. It has a strong smell, resembling that of chlorine, and it stains the hand of a brownish yellow colour, which, however, disappears after washing once or twice. Iodine may be prepared by evaporating a solution of kelp or barilla until no more crystals can be obtained, and then distilling the remaining liquor (in a glass retort and receiver) with concentrated sulphuric acid; when obtained, it should be washed with a little weak solution of potass, and dried upon blotting-paper.

Iodine unites with hydrogen, oxygen, carbon, chlorine, nitrogen, the metals, &c.; its combination with nitrogen is a most dangerous substance, as it explodes with great force by the slightest heat or friction, or even on being touched with a small piece of cold phosphorus. The iodides of the metals are remarkable for their brilliant colours; they are easily formed, by pouring a solu-

tion of hydriodate of potass into another of the metallic salt which we wish to decompose, and they are for the most part insoluble in water. A solution of iodine in water is much used as a test for starch, with which it produces a blue precipitate; and burnt sponge, which is often used in medicine, acts by means of the iodine which it contains.

Iodine, Tincture of. A solution of iodine in alcohol, which is used in medicine. It gives a bluish precipitate with solutions of starch, thus forming an excellent test for that substance.

Iridium. A white and brittle metal, of very difficult fusion, found in that part of the ore of platinum which is insoluble in chlorine.

Iridium obtained its name from *iris*, the rainbow, in consequence of the colours of its salts. It unites with the other metals as well as with chlorine, oxygen, &c. *For a method of obtaining all the metals from the ore of platinum, see Note 14, at the end of this volume.*

Iridium, Oxides of. Iridium combines with oxygen in two proportions, forming the blue protoxide and the red peroxide; neither these nor any of the other preparations of iridium, are of any importance.

Iron; formerly called *Mars*.—Iron is a metal of so much importance in the arts and manufactures of our country, that we shall be particularly explicit as to the different processes which it undergoes, before it is applied to useful purposes. It is of a whitish or bluish grey colour, has a

granular texture, is magnetic, and acquires polarity with great ease. When much beaten and rolled, it has a specific gravity of 7.800, but, under common circumstances, it seldom exceeds 7.700, and has often been found to be as light as 7.100. Pure iron is malleable, whether cold or hot; it is nearly as tenacious as gold, and, although it requires a most intense heat for its fusion, it is easily worked into different forms, as it possesses the useful property of welding, that is, that by the assistance of heat, several small masses of it may be beat into one, notwithstanding their being in the solid form. It is found in almost all earths and stones, and in all countries of the globe; large quantities of it are found in Norway, Sweden, England, and Wales, and it is looked upon as the most generally diffused substance in nature. Unlike most other metals, iron fuses by degrees; if exposed to strong heat, it first becomes red, and then gets softer and softer, until at last (if the heat be very intense) it runs into a liquid; it has a stronger affinity for oxygen than most other metals, except the bases of the alkalies, and, in consequence of this, it decomposes water at all temperatures, and may be corroded or dissolved by all acids. If the vapour of water be made to pass over iron turnings at a red heat, the metal is oxydated, and a considerable quantity of hydrogen gas is disengaged; the operation may be conducted by placing some iron turnings in the middle part of a gun-barrel or porcelain tube, one end of

which is connected with the pneumatic trough, while the other is luted to a retort containing water; if now, the part of the tube containing the turnings be heated to redness, and the water in the retort be made to boil, the steam which is formed will be decomposed by the iron, which will combine with its oxygen, while its hydrogen may be collected in the pneumatic apparatus.

If iron be digested in concentrated sulphuric acid, it is oxydated, the acid is partly decomposed, sulphurous acid gas is given out, and some of the sulphuric acid unites with the oxide of iron to form a sulphate; but if the acid be diluted, or if hydrochloric acid be used, hydrogen gas is disengaged in abundance, and the metal is dissolved without any decomposition of the acid taking place. Metallic iron is used as a test for cupreous salts in solution; for, if a bar of the metal be introduced, its superior affinity for oxygen precipitates the copper in the metallic state.

To obtain iron from its ores in the large way, those which contain sulphur or arsenic must first be roasted, to separate these substances which render the metal brittle; but, if the ore be of a stony nature, as those commonly called *iron stone, bog ore*, &c., it is exempt from this operation. It is then mixed with a sufficient quantity of coals and some limestone, or calcareous marle, to facilitate the fusion of the silicious matter, and the mixture thus made is put into a large blast furnace, and kept at a white heat for some hours;

at the end of which time a hole in the lower part of the furnace is opened, and the metal runs out in the state of *cast iron.* This is either immediately used by the common iron founders, or it is rendered malleable by forging, beating, rolling, &c., after which it is applicable to all the uses of common iron. When the metal contains phosphorus, (which is sometimes the case), it is found to be brittle when cold, but malleable when hot, and it is called by the workmen *cold-short;* but, if it is malleable when cold, and becomes brittle by the action of heat, *hot-short* is the name applied to it: the reason of the last mentioned defect is not known. Iron, when exposed to the air, becomes gradually oxydated, and converted into a red percarbonate, commonly called rust, and in this process it gains weight. It is one of the most generally useful metals we have; when beat into thin plates, and covered with melted tin, it is sold under the name of tin-plate; it combines with carbon in three proportions, forming *plumbago, cast-iron,* and *steel,* (*see* IRON, CARBURETS OF), its saline combinations are much used in medicine as tonics, and when combined with oxygen, it forms the brown colour used in porcelain painting.

Iron also combines with phosphorus, sulphur, chlorine, iodine, the metals, &c., and the salts, which its oxides form when combined with acids, are generally soluble in water.

IRON, ACETATE OF; formerly called *Chalybeate*

Vinegar, and Martial Xylocrate, or Epoxycrate.—The acetate of iron is not a salt of much consequence, but it is easily formed by digesting iron filings in distilled vinegar, when hydrogen gas is disengaged, and the metal is dissolved. The salt thus formed contains the protoxide of iron if protected from the action of the air, but, if exposed, oxygen is absorbed, and a peracetate, or acetate of the peroxide, is formed. The acetate of iron is sometimes used in medicine.

Iron, Aëriated. A name formerly given to the percarbonate of iron. *See* IRON, CARBONATES OF.

IRON, BENZOATE OF. An insoluble compound of benzoic acid and peroxide of iron, often occurring in chemical analysis. The quantity of iron contained in it may be estimated by exposing it to a red heat in an open vessel, with a little wax, when it becomes converted into a protoxide of iron. *See* AMMONIA, BENZOATE OF.

Iron, Calcined. A name promiscuously given by old authors to both the oxides of iron. *See* IRON, OXIDES OF.

IRON, CARBONATES OF; formerly called *Aëriated Iron, and Rust of Iron.*—Both the oxides of iron combine with carbonic acid, but the red percarbonate is the combination which is best known; it is obtained by decomposing any of the soluble salts of iron, with carbonate of potass, and drying the precipitate by exposure to air. The percarbonate thus obtained, is always in the state of

a hydrate, unless exposed to a gentle heat, and, when thus deprived of water, it contains about 45 per cent. of the metal; but, as it is difficult to dry it entirely without risk of decomposition, in chemical analysis it is always best to heat it to redness with a little wax, when it is converted into a protoxide, and may be estimated accordingly.

The protocarbonate of iron is obtained by means of an alkaline carbonate, from any of the soluble proto-salts of the metal; it is of a green colour when pure, but if exposed to air, it becomes converted into a red carbonate by the absorption of oxygen. The best method of drying this salt in a state of purity is to wash it well first with water, and then with alcohol; after which it may be dried under the receiver of an air-pump, without the application of heat; it is converted into a protoxide of iron by heating it with wax, but is of no use in the arts.

Both these carbonates are insoluble in pure water, but the one containing the peroxide may be dissolved in a solution of carbonic acid.

Iron, Carburets of. Iron combines with carbon in several proportions, forming the supercarburet, commonly called *plumbago;* the carburet, commonly called *cast-iron,* and the subcarburet, which contains various proportions of carbon, and is much used in the arts under the name of *steel.*

Supercarburet of iron (*plumbago*) is a mineral substance found in nature, and used for making pencils; it is said to consist of about 95 parts of

carbon, and 5 of iron, and may be imitated by art. It is infusible in all our furnaces, but is said to have been fused into a sort of glass by the flame of the oxyhydrogen blow-pipe; when obtained by art it is not so compact and even as that found in a natural state.

Carburet of iron (*cast iron*) is a brittle metallic substance, formed whenever fused iron comes in contact with carbon; it contains much less carbon than the last mentioned compound, but a small quantity of silicum (which it has obtained from the silica of the ore from which the iron is procured) is generally combined with it. Cast-iron is easy of fusion when compared with the pure metal.

Subcarburet of iron (*steel*) is a well known compound, differing in the proportions of its component parts according to the process made use of in its preparation; it is the most useful combination of the metal, and is usually obtained in the following manner. A number of small bars of the best malleable iron are embedded in a large crucible full of charcoal powder, a cover is luted to the crucible, and the whole is exposed to a red heat for about ten or fifteen hours, according as we wish the steel to be softer or harder. The bars of iron having been thus treated are remarkably altered in their properties; they have gained weight by the carbon which they have absorbed, and, if plunged while hot into cold water, they will become much harder than pure iron.

As the steel thus obtained is not uniform in its texture, the bars should either be converted into cast-steel by fusing them in a covered crucible without addition, or three or four of them should be welded together, when, after being beaten for some time, they will be found fit for all the purposes to which steel is applicable.

Steel is distinguished from pure iron by letting a drop of diluted nitric acid fall on it; if the metal be steel, a black spot is formed, but otherwise no such appearance is produced. It may be alloyed with silver, and when it contains about $\frac{1}{500}$th of this metal, it is said to be far superior in toughness and hardness to the best pure steel.

Iron, Cast. The commercial name of that compound of carbon and iron, properly called carburet of iron. *See* IRON, CARBURETS OF.

IRON, CHLORIDES OF; formerly called *Dried Muriates of Iron.*—Iron unites with chlorine in two proportions, forming the chloride or protochloride, and the perchloride. The protochloride is obtained by dissolving the metal in diluted hydrochloric acid, and evaporating the solution to dryness out of the contact of air, when a grey brittle substance is obtained; it is soluble in water, forming the hydrochlorate, which, being slowly evaporated, yields crystals of a hydrated chloride, having a light-green colour.

The perchloride is obtained either by burning iron-wire in chlorine gas, or by evaporating a solution of the perhydrochlorate; it is of a reddish

colour, deliquesces in the air, and when dissolved in water, a perhydrochlorate is formed. These compounds are of no use in the arts, but it must be remembered, in preparing the protochloride, that during the evaporation, great care must be taken to prevent a circulation of air over the surface of the liquid. The protochloride of iron is insoluble in alcohol.

Iron, Colcothar of. A name given to the impure peroxide of iron which remains in the retort when sulphate of iron has been distilled for the purpose of obtaining sulphuric acid. It is used for cleaning polished steel, and sometimes as a pigment, as it has a fine red colour. *See* IRON, OXIDES OF.

Iron, Cold-Short. A name given by workmen to a particular kind of iron, which is brittle when cold, but malleable when heated; its brittleness is caused by its containing some phosphorus. *See* IRON.

IRON, CYANIDE OF; formerly called *Prussian Blue, Berlin Blue, Prussiate of Iron, and Martial Cyanocrate.*—The cyanide or cyanuret of iron is a well known insoluble blue compound, much used in the arts as a pigment; various theories have been advanced with regard to its composition, but it seems most rational to consider it as a combination of cyanogen (the base of the hydrocyanic acid) with iron. For the purposes of art it is formed in the following manner. Equal parts of common carbonate of potass and horns, bones,

dried bullock's blood, or any other animal matter, are well mixed, and the whole is calcined in a crucible at a red heat, until it no longer yields flame or smoke. It is then well washed with water, by which means we obtain a solution of carbonate and hydrocyanate of potass. The carbonate had existed in the first instance, but a cyanide of potassium has been formed during the calcination by means of the animal matter; the carbon and nitrogen of which have formed a cyanide with the potassium of the potass, while the hydrogen (which is always present in blood, bones, &c.) has carried off its oxygen in the form of water; the cyanide thus formed being dissolved by washing, it is converted into a hydrocyanate of potass. We now make a solution of equal parts of sulphate of alumina (*alumn*) and persulphate of iron (formed by exposing the protosulphate to air) and upon mixing the hydrocyanate of potass with it, we obtain a precipitate which (if not of the proper colour) must be washed with a little very dilute nitric acid; it consists of cyanide of iron and carbonate of alumina. If the cyanide of iron is wanted for use in the laboratory, no alumn should be used in its preparation; when it is boiled with alkalies or earths we obtain a ferrohydrocyanate of the alkali, and a red peroxide of iron remains undissolved.

Iron, Cyanocrate of. *See* IRON, CYANIDE OF.

IRON, CYANURET OF. *See* IRON, CYANIDE OF.

Iron, Hot-Short. A name given to a peculiar

kind of iron, which, for some unknown reason, is brittle if heated, though malleable when cold. *See* IRON.

IRON, HYDROCHLORATES OF; formerly called *Muriates of Iron.*—Both the oxides of iron form distinct compounds with hydrochloric acid; the protohydrochlorate is best obtained by dissolving the sulphuret of iron in the acid, as the sulphuretted hydrogen, which is disengaged, prevents any of the metal being peroxydated. When thus obtained it is used as a test for oxygen in mineral waters, for, if a drop of the test be added to oxygenated water, it is immediately converted into a red perhydrochlorate of iron. If the protohydrochlorate be slowly evaporated, green crystals are obtained, but these no longer consist of hydrochlorate, but of hydrated protochloride of iron.

The perhydrochlorate is obtained by exposing the protohydrochlorate to air, or by dissolving peroxide of iron in hydrochloric acid; it is of a red colour, and when evaporated to dryness a deliquescent perchloride is formed.

Iron, Ludivico's Tincture of. An old name for a solution of tartrate of iron, sometimes used in medicine.

Iron, Magistery of. A name formerly given to the protoxide of iron. *See* IRON, OXIDES OF.

Iron, Muriates of. This term was formerly applied indiscriminately to the chlorides and hydrochlorates of iron. *See* IRON, CHLORIDES OF, *and* IRON, HYDROCHLORATES OF.

IRON, NITRATES OF. The nitrates of iron are not of any use; they are soluble in water, and are easily formed by dissolving the metal in nitric acid. If the acid used be strong, a solution of a red pernitrate of iron is formed, but, if very dilute, we obtain an olive-brown liquid, consisting of protonitrate of iron holding some peroxide of nitrogen (*nitric oxide*) in solution; it cannot be crystallized, and exposure to air converts it into a pernitrate.

Iron, Ochre of. A mineralogical name for a percarbonate or peroxide of iron.

Iron, Oil of. An old name for a solution of iron in hydrochloric acid. *See* IRON, HYDROCHLORATES OF.

IRON, ORES OF. Of all ores, those of iron are the most common, and the most easily known; they are usually of a brownish-red or black colour, and become magnetic by the flame of the blowpipe.

The red argillaceous ores are mostly found in the neighbourhood of coal-mines, and, indeed, often in coal-mines themselves; when thus found, if pretty free from stony matter, they are immediately thrown into the furnace without any further preparation, and they afford very good iron, but seldom much of it.

Malleable iron occurs native, it is generally massive or in plates, is found in veins of iron-stone, has a specific gravity of about 7.570, and

usually contains about 6 or 8 per cent. of copper and lead.

The common magnetic ore is an impure protoxide of iron, and may be reduced by coals; it is found massive, crystallized, black, and brittle; it is infusible before the blow-pipe, but becomes brown. It often has a metallic lustre, produces excellent bar-iron, and has a specific gravity of about 4.700.

Granular magnetic iron ore is found in the form of small black grains, which have a specific gravity of 4.600; it usually contains oxide of manganese, and oxide of titanium.

Specular iron ore, or iron glance, has a brilliant metallic lustre; it occurs massive and crystallized, has a specific gravity of 5.200, and is slightly magnetic. It consists of oxide of iron, mineral oil, magnesia, and phosphate of lime, and is sometimes found in thin plates, when it is called micaceous specular iron ore.

Bog iron ore, and pitchy iron ore, are both impure oxides of the metal; the latter usually contains phosphoric acid, and they both have a specific gravity, varying from 2.000 to 3.500. All the ores above-mentioned may be reduced to the metallic state by heating them with coals or other carbonaceous matter.

Iron pyrites, or bisulphuret of iron, is found massive, and crystallized in various forms; it possesses great lustre, has a bronze yellow colour,

and burns like sulphur before the blow-pipe, leaving a brown magnetic globule. Its specific gravity is about 4.800, and it consists chiefly of iron and sulphur, but sometimes contains a little silver or gold, when it is called argentine or auriferous pyrites.

Besides the iron ores above-mentioned, there are also native arseniates, carbonates, sulphates, phosphates, and an ore of the colour of indigo, which is found in Africa, and consists of oxide of iron, silica, lime, carbonate of soda, and water; they may all be assayed in the dry way by roasting them and fusing them with black flux; but, if it is necessary to be exact as to the earths contained, the humid way of analysis is to be preferred. *For an example of the analysis of iron ores, see Note* 1, *at the end of the volume.*

IRON, OXIDES OF; formerly called *Calces of Iron, and Calcined Iron.*—The oxides of iron are two; they are sometimes used in medicine, and may be prepared as follows. To prepare the protoxide, a protosulphate of iron is decomposed by a solution of pure potass, when a green precipitate of a hydrated protoxide takes place; this precipitate, when washed with water, is dried at a red heat, by which means it becomes black, and is converted into a pure protoxide of iron. If it be exposed to air it becomes converted into a peroxide, or even a percarbonate, as our atmosphere always contains carbonic acid; it consists of

about 78 iron, and 22 oxygen, and may be obtained by beating red-hot iron, but, when formed by this last method, it always contains some iron in the metallic state.

The peroxide is of a red colour, and may be obtained by exposing the protoxide to air, or by pouring a solution of an alkali into any of the per-salts of iron, when the oxide will be precipitated in the form of a hydrate, which shrinks very much in drying; it contains about 70 per cent. of the metal, and may be reduced to the state of a protoxide, by heating it with a little wax. Both the above oxides are used in porcelain painting, and the salts of the protoxide are green, while those of the peroxide are brown or red.

IRON, PERCARBONATE OF; formerly called *Rust of Iron, Red Carbonate of Iron, and Ochre of Iron.*—A combination of carbonic acid with peroxide of iron. *See* IRON, CARBONATES OF.

IRON, PERCHLORIDE OF. A compound of iron with the largest proportion of chlorine. *See* IRON, CHLORIDES OF.

IRON, PERHYDROCHLORATE OF; formerly called *Permuriate of Iron.*—A compound of hydrochloric acid with peroxide of iron. *See* IRON, HYDROCHLORATES OF.

Iron, Permuriate of. A name given to the perhydrochlorate of iron, when hydrochloric (*muriatic*) acid was supposed to be a compound of *muriatium* and oxygen. *See* IRON, HYDROCHLORATES OF.

IRON, PERNITRATE OF. A compound of nitric acid and peroxide of iron. *See* IRON, NITRATES OF.

IRON, PEROXIDE OF; formerly called *Red Oxide of Iron, Saffron of Mars, &c.*—A compound of iron with the largest proportion of oxygen. *See* IRON, OXIDES OF.

IRON, PER-SALTS; formerly called *Red Martial Salts, or Red Salts of Iron.*—Saline compounds of the peroxide, or *red oxide* of iron; they are of a red colour, and may be formed by exposing the proto-salts to the action of air.

IRON, PERSULPHATE OF; formerly called *Red Sulphate of Iron, Red Martial Vitriol, &c.*—A compound of sulphuric acid, and peroxide, or *red oxide* of iron. *See* IRON, SULPHATES OF.

IRON, PHOSPHATE OF. A white insoluble compound of peroxide of iron and phosphoric acid; it is sometimes used in medicine, and may be formed by adding phosphate of soda to a solution of persulphate of iron.

Phosphate of iron is sometimes found native.

IRON, PROTOCHLORIDE OF. A combination of iron with the first and smallest proportion of chlorine. *See* IRON, CHLORIDES OF.

IRON, PROTOHYDROCHLORATE OF; formerly called *Protomuriate of Iron.*—A compound of protoxide, or *black oxide* of iron with hydrochloric acid. *See* IRON, HYDROCHLORATES OF.

Iron, Protomuriate of. *See* IRON, PROTOHYDROCHLORATE OF.

IRON, PROTONITRATE OF. A compound of protoxide of iron with nitric acid. *See* IRON, NITRATES OF.

IRON, PROTO-SALTS OF; formerly called *Green Martial Salts, or Green Salts of Iron.*—Saline compounds of the protoxide or *black oxide* of iron; they are all of a green colour when pure, but, if their solutions be exposed to the air, oxygen is absorbed, and they are converted into the red per-salts.

IRON, PROTOSULPHATE OF; formerly called *Green Sulphate of Iron, Vitriol, Martial Vitriol, Salt of Steel, and Green Vitriol.*—A soluble salt, consisting of protoxide or *black oxide* of iron, combined with sulphuric acid. *See* IRON, SULPHATES OF.

IRON, PROTOXIDE OF; formerly called *Black Oxide of Iron, and Martial Ethiops, or Æthiops.*—A compound of iron with the smallest proportion of oxygen. *See* IRON, OXIDES OF.

Iron, Prussiate of. Before the composition of *prussic* (hydrocyanic) acid was known, *Prussian blue* was thought to be a compound of it with oxide of iron; but it has since been found, that the acid is a compound of hydrogen with a substance called cyanogen, and that *Prussian blue* is only a compound of cyanogen and iron; hence it is called cyanide of iron, and the acid is called hydrocyanic acid. *See* IRON, CYANIDE OF.

Iron Pyrites. A mineralogical name for a native bisulphuret of iron. *See* IRON, ORES OF.

Iron, Rust of. *See* IRON, PERCARBONATE OF.

IRON, SULPHATES OF; formerly called *Martial Vitriols.*—Both the oxides of iron unite with sulphuric acid, but, as the protosulphate is of some consequence in the arts and manufactures, we shall notice it first, and then proceed to the persulphate.

The protosulphate, or *green sulphate* of iron, is a very soluble salt, formed by the combination of sulphuric acid with the protoxide of the metal; it crystallizes in rhomboidal prisms, is of a beautiful light-green colour, and is often formed in the laboratory by digesting iron filings or turnings in diluted sulphuric acid, and crystallizing the salt when no further action takes place. It is a very cheap substance, and is generally manufactured in the large way by the following process.

Native sulphuret of iron (*pyrites*), which consists chiefly of sulphur and iron, is exposed in heaps to the air and rain for about a year; around the heaps there are channels, by which the water which passes through them is conducted to proper vessels. When the whole has been sufficiently exposed, it is lixiviated with water as long as the solution obtained continues to be rendered turbid by the addition of an alkali; after which it is mixed with the rain-water, which had run off by the channels, and evaporated until a pellicle appears, by which means crystals are obtained when the liquid cools.

The salt thus procured contains about 40 per

cent. of water solidified in its crystals; it is much used by dyers, ink-makers, &c., but never in the state of a protosulphate, as they always leave it exposed to air, when oxygen is absorbed, and a persulphate is formed. The persulphate of iron produces a black precipitate with infusion of galls, but the protosulphate has no such effect; and hence it is that ink (which is made by boiling 2 oz. of nut-galls, 1 oz. of protosulphate of iron, and 1 oz. of gum arabic, in two pounds of water) never attains its utmost blackness until it has been exposed to the action of air for several weeks.

The protosulphate of iron is insoluble in alcohol, but its aqueous solution will absorb a large quantity of peroxide of nitrogen (nitrous gas) forming a liquid capable of absorbing oxygen gas. The solution of protosulphate of iron containing peroxide of nitrogen is used for ascertaining the quantity of oxygen gas contained in the air, and this is done by inverting a graduated vessel of air in a saucer of the liquid, when the oxygen is absorbed, and the other gases remain behind.

Persulphate of iron is of no great use in the laboratory; it may be formed by the direct mixture of its component parts (sulphuric acid and peroxide of iron) or by exposing a solution of the protosulphate to air for a long time, but a far more easy and expeditious method of preparing it is to boil the protosulphate with a little nitric acid. It is soluble, deliquescent, and cannot be crystallized; but, if combined with a second por-

tion of sulphuric acid, it becomes crystallizable, and is converted into a bisulphate.

Iron, Sulphurated. *See* IRON, SULPHURETS OF.

IRON, SULPHURETS OF. There are two compounds of sulphur and iron, namely, the sulphuret which is formed by art, and when found native, is called *magnetic pyrites*, and the bisulphuret, which is entirely a native production, and is called by mineralogists *common pyrites*, (*see* IRON, ORES OF). The sulphuret is of a black colour, and may be obtained by fusing iron and sulphur together; it is useful in the laboratory for the formation of sulphuretted hydrogen, as also for obtaining the protosalts of iron. It is much more fusible than the pure metal; and hence, if a bar of iron at a white heat be rubbed with a lump of sulphur, the two substances combine and run down together.

Iron, Tartarised. *See* IRON, TARTRATE OF.

IRON, TARTRATE OF. A soluble compound of tartaric acid and oxide of iron; it may be formed by double decomposition, and is used in medicine.

Iron, Vitriols of. *See* IRON, SULPHATES OF.

Iron, Zwelfer's Saffron of. A name given to the red peroxide of iron. *See* IRON, OXIDES OF.

ITTRIA. *See* YTTRIA.

ITTRIUM. *See* YTTRIUM.

Jupiter. An old name for TIN. The ancients, knowing but few metals, gave them the names

of the sun, moon, and planets; hence tin was called Jupiter.

K.

KALI. A name formerly given to the alkali now called potass, because it is sometimes obtained from a plant called *kali*. *See* POTASS.

Kali, Aëriated. Kali, Prepared. *See* POTASS, CARBONATES OF.

Kelp. The ashes of sea-weeds, from which soda is obtained.

Kermes Mineral. A preparation of antimony, formed by boiling a solution of carbonate of potass with sulphuret of antimony, filtering the liquid, and collecting the precipitate which falls. It is of a brown colour, and was formerly used in medicine.

King's White. The precipitate formed by mixing nitrate of bismuth with water; it consists of oxide of bismuth.

King's Yellow. *See* ARSENIC, SULPHURET OF.

Kupfer, Nickel. A name formerly given to the impure native nickel, which is plentifully found in Germany. *See* NICKEL.

L.

LAC, WHITE. White lac is a substance deposited by certain insects in an Indian tree called *bihar*, and used for the preparation of varnishes,

the laccic acid, &c.; it is brought to us in the form of sticks (*stick lac*), small grains (*seed lac*), or flat cakes (*shell lac*), but it is always the same substance, although the first sort is reckoned best for pharmaceutical purposes.

The laccic acid is procured from the stick lac by a complicated process, which we do not describe, as the acid has never been applied to any use, and its properties are not interesting.

LACTATES. A class of salts of no importance, formed by the combination of lactic acid with alkalies, &c. All the lactates which have been formed are soluble in water.

Lakes. Compounds of the colouring matter of certain plants with alumina; they are used by painters, and may generally be made by adding sulphate of alumina (*alumn*) to an infusion of the plant, and separating the coloured precipitate which is formed.

Lapis Caliminaris. An ore of zinc commonly called calamine; it consists of oxide of zinc combined with carbonic acid.

Lapis Infernalis. Fused nitrate of silver or *lunar caustic*. *See* SILVER, NITRATE OF.

LAPIS LAZULI. A well known mineral, of a beautiful azure blue colour; it consists of 46 silica, 28 lime, 14.5 alumina, 3 oxide of iron, 6.5 sulphate of lime, and 2 water, and is used for making the pigment called ULTRAMARINE.

Lapis Ponderosus. A name given to a native tungstate of lime of a great specific gravity.

LAZULITE. *See* AZURITE.

LEAD; formerly called *Saturn*.—Lead is a malleable metal, of a bluish white colour, having a specific gravity of about 11.400; it melts before ignition at a temperature of about 540° Fahr., is somewhat volatile at a white heat, and may be burnt on a piece of red-hot charcoal before the jet of an oxygen blow-pipe. The nitric acid dissolves lead with vehemence, but the sulphuric and hydrochloric acids have little or no action upon it even when assisted by heat. Lead is much used in commerce for covering house-tops, lining cisterns, &c., and its combinations with oxygen alone, or with oxygen and some of the acids, are much used as pigments. Lead combines with oxygen in 3 proportions, forming the protoxide, the deutoxide, and the peroxide, (*see* LEAD, OXIDES OF); it also unites with chlorine, iodine, sulphur, and many of the metals. It is precipitated from its acid solutions by iron and zinc, but the best test, for minute portions of it, is sulphuretted hydrogen, with which it produces a black or brown precipitate of sulphuret of lead.

If an ounce of acetate of lead be dissolved in a pint and a half of water, and a piece of zinc attached to a wire, be suspended in the clear solution; in a few hours a brilliant metallic crystallization of lead will have taken place on the zinc. This precipitation is commonly called the lead-tree, and it is owing to the superior affinity which

zinc has for the oxygen, which was, in the first instance, combined with the lead.

LEAD, ACETATES OF; formerly called *Sugar of Lead, Vegeto-Mineral Salt, and Goulard's Extract.*—The acetate of lead is an important salt in commerce; it is usually formed in the large way by exposing coils of metallic lead to the fumes of good vinegar, immersing them in the liquid, and evaporating the solution for crystallization, or by dissolving litharge in the acetic or *pyroligneous* acid formed in the distillation of wood.

If a solution of acetate of lead be boiled for some time with powdered litharge, it takes up a part of it, and becomes converted into a subacetate, which is again converted into an acetate by the contact of carbonic acid gas, which precipitates the second portion of oxide in the state of a carbonate.

Subacetate of lead precipitates all vegetable colouring and extractive matter; and hence it is much used in the analysis of wines, in order to find out the exact portion of alcohol which they contain; for this purpose, 1 part of a saturated solution of the salt is added to 8 of the wine, to be assayed. A precipitate will immediately fall, and the whole being filtered, the clear liquid is saturated with perfectly dry carbonate of potass, which (having a greater affinity for water than alcohol has) will form a heavy aqueous solution, on the top of which the alcohol will be found floating; it may be separated by decantation, and the

proportion which it bears to the wine ascertained.

Lead, Ashes of. A name formerly given to a protoxide of lead obtained by heating the metal in a current of air. *See* LEAD, OXIDES OF.

LEAD, CARBONATE OF; formerly called *White Lead, and Ceruse.*—A white insoluble salt, containing 85 per cent. of pure lead, the rest being carbonic acid and oxygen; it is usually manufactured by boiling litharge with impure vinegar until a subacetate of lead is formed, and allowing the carbonic acid of the atmosphere to precipitate the carbonate of lead, when the liquor is poured off and treated as before, until all the litharge has been dissolved and precipitated. The chief use to which carbonate of lead is applied, is that of house-painting. It is sometimes found native in the form of crystals.

LEAD, CHLORIDE OF; formerly called *Muriate of Lead, Horn Lead, Salitated Lead, and Patent Yellow.*—A compound of lead, sparingly soluble in water, but easily soluble in nitric acid; it may be formed by boiling granulated lead in a mixture of nitric and hydrochloric acids, when the chloride will be deposited in the form of small crystals, which are white, but, on being fused, they lose a portion of water with which they were combined, at the same time becoming yellow. The chloride of lead thus freed from water contains about 25 per cent. of chlorine, the rest being pure lead.

LEAD, CHROMATE OF; formerly called *Chrome Yellow.*—A combination of oxide of lead with the

chromic acid, which, as it is insoluble in water, may be prepared by pouring a solution of chromate of potass into a solution of any of the salts of lead; it is of a bright yellow colour, and is much used as a pigment.

The chromate of lead is sometimes found native.

LEAD, DEUTOXIDE OF; formerly called *Minium, Red Lead, and Orange-coloured Ceruse.*—A compound of lead with more oxygen than is contained in the protoxide, but less than is contained in the peroxide. *See* LEAD, OXIDES OF.

Lead, Fulminating. A name given to the nitrate of lead, which detonates strongly when heated with charcoal. *See* LEAD, NITRATE OF.

Lead, Glass of. A name formerly given to a fused protoxide of lead containing silica, and many other impurities. It was used as a flux by the old chemists. *See* LEAD, OXIDES OF.

Lead, Goulard's Extract of. A solution of subacetate of lead, much used in medicine. *See* LEAD, ACETATES OF.

Lead, Gummate of. A name given by Berzelius to a precipitate formed by pouring a solution of subacetate of lead into gum-water.

Lead, Horn. *See* LEAD, CHLORIDE OF, which, when fused, somewhat resembles horn.

LEAD, IODIDE OF. A combination of iodine and lead, which is of a yellow colour, and insoluble in water. It is of no importance in the arts, but might be used as a pigment.

Lead, Muriate of. *See* LEAD, CHLORIDE OF.

LEAD, NITRATE OF; formerly called *Nitrated Lead, Fulminating Lead, and,* when in solution, *Oil of Lead.*—A salt easily formed by dissolving lead, or its protoxide, in nitric acid; it is very soluble in water, may be crystallized, and is chiefly used as a test for sulphuric acid, which precipitates from it an insoluble sulphate of lead; it is also useful in the laboratory for obtaining any of the insoluble salts of lead, as the chromate, the arseniate, &c. &c.

Lead, Oil of. An old name for a strong solution of the nitrate of lead. *See* LEAD, NITRATE OF.

LEAD, ORES OF. The ores of lead are rather numerous, although galena, which consists of lead and sulphur, containing sometimes arsenic, antimony, iron, &c., is the only one which is plentiful enough to be worked. Lead is found combined with oxygen in the ore called native minium, with chlorine in the native muriate, or chloride of lead, and with oxygen and carbonic acid in the native carbonate; it also occurs in the state of a phosphate, a sulphate, a molybdate, a chromate, and an arseniate. These five last varieties are all of different shades of yellow or brown, with the exception of the sulphate, which is colourless. The sulphuret of lead *(galena)* is brittle, and usually has a brilliant metallic lustre; it almost always contains silver, and the less brilliant varieties

generally contain the most. *For an example of the analysis of lead ores, see Note* 13, *at the end of the volume.*

LEAD, OXIDES OF; formerly called *Calces of Lead.*—Lead combines with oxygen in three proportions, forming the yellow protoxide, which enters into the composition of the salts; the red deutoxide, which is commonly called *minium* or *red lead,* and the brown peroxide, which is of no importance in the arts, and of little use in the laboratory. The protoxide, which contains about 93 per cent. of pure lead, sometimes occurs in the analysis of metallic ores, and it is easily obtained by decomposing any salt of lead by potass or soda. When first precipitated it is white, because it contains water, but, if dried at a dull red heat, it becomes yellow.

The deutoxide, which is red, is much used as a pigment; it is obtained by calcining metallic lead at a red heat with free access of air; it may be converted into a protoxide by a bright red heat, which fuses it, at the same time causing the evolution of oxygen gas.

The peroxide is obtained by digesting the deutoxide in nitric acid, which dissolves one part, leaving the other combined with a larger portion of oxygen. Fixed vegetable oils, if heated with the oxides of lead, dissolve a considerable portion of them, at the same time being converted into what is commonly called *drying oil.*

The peroxide and deutoxide of lead, when ex

posed to a strong red heat, give out oxygen gas, and fuse into a protoxide commonly called *litharge;* in consequence of this the deutoxide is often used for the formation of oxygen gas, which is obtained from it by heating it in a retort connected with the pneumatic trough.

LEAD, PEROXIDE OF. The oxide of lead containing the largest portion of oxygen. *See* LEAD, OXIDES OF.

LEAD, PHOSPHATE OF. An insoluble compound of protoxide of lead with phosphoric acid; it occurs native, and has been recommended for the manufacture of phosphorus, but it only yields a small quantity of that substance, and is decomposed with difficulty.

LEAD, PHOSPHURET OF. A compound of lead and phosphorus, obtained by throwing little bits of phosphorus on melted lead. It is of no use, and resembles pure lead in appearance.

LEAD, PROTOXIDE OF; formerly called *Massicot, Litharge, and Yellow Oxide of Lead.*—A compound of lead with the smallest proportion of oxygen. *See* LEAD, OXIDES OF.

Lead, Red. A common name for the deutoxide of lead, which is of a red colour. *See* LEAD, OXIDES OF.

Lead, Scribes. A compound of iron and carbon, properly called a supercarburet of iron. *See* IRON, CARBURETS OF.

LEAD, SUBACETATE OF. A compound of acetic acid with a larger portion of oxide of lead than is

contained in the simple acetate. For the manner of its preparation, *see* LEAD, ACETATES OF.

LEAD, SUBNITRATE OF. A compound formed by boiling a solution of the nitrate upon the protoxide of lead. It contains more oxide of lead than the nitrate.

Lead, Sugar of. See LEAD, ACETATES OF. The simple acetate of lead obtained this name from its sweet taste.

LEAD, SULPHATE OF; formerly called *Vitriol of Lead.*—An insoluble and useless compound of protoxide of lead and sulphuric acid; it is found native, and, as lead is usually precipitated from its solutions by sulphate of soda, it often occurs in the analysis of lead ores, and other compounds of lead. It contains about 68 per cent. of the metal, the rest being oxygen and sulphuric acid.

LEAD, SULPHURET OF. A compound of sulphur and lead abundantly found in nature. It may be formed by throwing sulphur on melted lead, and it is much more infusible than the pure metal.

Lead, Vinegar of. A solution of subacetate of lead.

Lead, Vitriol of. See LEAD, SULPHATE OF.

Lead, White. See LEAD, CARBONATE OF.

Lees, Soap. An aqueous solution of potass or soda used in making soap.

Lemons, Acid of. See ACID, CITRIC.

Leys, or Lees. Aqueous solutions of potass or soda.

LIGHT. Several theories have been advanced by philosophers as to what light is; some have supposed it to be a real substance, in very minute particles; others maintain that it is merely an effect which certain bodies have upon the organs of sight; but, as none of these have been satisfactorily proved, we shall merely describe the most curious effects which light has upon different substances.

Light has been stated to be the chief cause of odour, and it is certainly the sole cause of colour, whence vegetables, if kept in the dark, grow white, but, if light be admitted on one side of them, they become coloured on that side only. Light has a great influence on condensation and crystallization; if camphor be put into a stopped bottle, one side of which is exposed to a strong light, the small quantity of it which sublimes at the common temperature of the atmosphere, always condenses in a crystalline form on the side thus illuminated. Salts also crystallize much more readily when exposed to light.

Several substances have the property of absorbing light when exposed to it, and giving it out again when in darkness. *See* BODIES, PHOSPHORESCENT, and *Phosphorus Boulonian*, &c.

Light, in many instances, has a great deoxydating power, especially on the oxides of mercury, bismuth, silver, and gold, some of which it entirely reduces to the metallic state.

As light and heat constantly accompany each

other in all common phenomena, the young student may, at first, suppose the one to be essential to the other, but we have several proofs to the contrary; for instance, if pure hydrogen gas be burned, it gives hardly any light, whereas we have no other combustion which gives so great a heat; from this circumstance we infer that the greater part of the light extricated in combustion is owing to the combustible itself, and not to the air (oxygen gas) which supports the combustion; for, if the latter were the case, as hydrogen decomposes a larger proportion of air for its combustion than any other substance, it would necessarily give a very strong light.

LIGNIN. A name applied to the fibrin of vegetable matter to distinguish it from that of animal origin. *See* FIBRIN.

LIME; formerly called *Calcareous Earth,* and *Earth of Oyster-Shells.*—A very useful earth, composed of a metallic base called calcium and oxygen; it is in nature never met with in a pure state, but always combined with an acid, and very frequently with the carbonic acid, as in limestone, chalk, marble, &c.

To prepare pure lime, a quantity of clean white marble is put into an earthenware retort, which is connected with the pneumatic apparatus; the retort is gradually raised to a bright red, or white heat, at which temperature it is kept until no more gas is disengaged. The remainder of the marble in the retort is now remarkably altered, it

no longer effervesces with acids, as it did before, and it has acquired a burning caustic taste, and other alkaline properties, whence it is called an alkaline earth.

Pure lime produces a strong heat when mixed with water, which it imbibes and solidifies in its pores, forming a hydrate; it requires 680 times its weight of water to dissolve it, and the solution, which is called lime-water, remains unchanged in well closed vessels, but, when exposed to the air, it absorbs carbonic acid, and an insoluble carbonate of lime is precipitated.

Lime forms the base of common mortar, and it is much used in agriculture; it is infusible, when pure, by the strongest fire, but, if mixed with silica, both these substances fuse together.

Lime is often found very useful in agriculture, for rendering heavy and aluminous soils more porous; but it has been found by experiment, that sand and lime together produce this effect much better than lime alone.

LIME, CARBONATE OF; formerly called *Aëriated Lime, Mild Calcareous Earth, Flour of Lime, and Cream of Lime.*—An insoluble compound of carbonic acid and lime, abundantly found in nature, in the form of *limestone, calcareous spar, marble, double refracting spar, calcareous stalactites, &c.*, and chiefly used for obtaining quick-lime, or carbonic acid; it is insoluble in pure water, but in water containing free carbonic acid a small portion of it may be dissolved. *See* LIME.

LIME, CHLORIDE OF; formerly called *Oxymuriate of Lime.*—A soluble compound, formed by exposing hydrated lime (*slacked lime*) to the action of chlorine gas, which it absorbs.

Chloride of lime is sold in the shops under the names of *bleaching-powder* and *bleaching-salts*, and its solution is much used for removing fruit-stains from linen, as it destroys all vegetable colouring matter.

Lime, Cream of. *See* LIME, CARBONATE OF. The pellicle which forms on the surface of lime-water, when exposed to the atmosphere, was formerly used in medicine under the name of *cream of lime;* it consists entirely of pure carbonate of lime.

Lime, Flour of. When quicklime is left exposed to the air for some time it becomes converted into a carbonate, at the same time falling into a dry powder. This powder was formerly called flour of lime.

Lime, Fluate of. *See* CALCIUM, FLUORIDE OF.

Lime, Liver of. *See* LIME, SULPHURET OF.

Lime, Muriate of. *See* CALCIUM, CHLORIDE OF.

Lime, Oil of. A name formerly given to a very strong solution of hydrochlorate, or muriate of lime, which has the consistency of an oil.

LIME, OXALATE OF; formerly called *Saccharated Lime.*—A compound of lime and oxalic acid, containing about 44 of the former, and 56 of the latter; it is perfectly insoluble in water, and

hence the oxalate of ammonia is much used as a test for lime, which has a greater affinity for the oxalic than for any other acid.

LIME, PHOSPHATE OF; formerly called *Earth of Bones, and Animal Earth.*—The phosphate of lime is insoluble in water and infusible, except in a most violent fire. It is easily obtained pure enough for all common purposes by burning bones, or any other animal substance, until there remains nothing but a white ash. The phosphate of lime thus obtained always contains some carbonate of lime, and other impurities; it is principally used for making phosphorus and the cupels in which gold and silver are purified. *See Note 3, at the end of this volume.*

LIME, PHOSPHURET OF. A compound of phosphorus and lime, which evolves phosphuretted hydrogen gas when put into water, at the same time being partly converted into a phosphate. It is easily formed by heating phosphorus and pure lime together in an earthenware tube.

Lime, Saccharated. *See* LIME, OXALATE OF, which was called *saccharated lime*, because the oxalic acid is obtained from sugar.

LIME, SULPHATE OF; formerly called *Plaister of Paris, Gypsum or Gyps, Alabaster, and Vitriolated Lime.*—This is a compound of abundant occurrence in nature, as well as in the analysis of many earthy minerals; when it has been well dried at a low red heat, it may be mixed with water to the consistency of cream, and this mixture will

become quite hard in about ten minutes; hence it is used for taking casts, cementing marble, &c. Like all other sulphates, when mixed with charcoal and exposed to a red heat, it is converted into a sulphuret, which may be decomposed by almost all the acids, although the sulphate itself is only decomposable by the oxalic acid.

A dry calcined sulphate of lime contains about 40 per cent. of lime, the rest being sulphuric acid, but, when not recently calcined, it is always combined with a large quantity of water, forming what is called a hydrated sulphate of lime.

Lime, Sulphuret of; formerly called *Liver of Lime.*—A compound of sulphur and lime easily formed by exposing a mixture of sulphur and lime to a strong heat. When put into water it becomes a hydrosulphuret, some sulphate is formed, and from the sulphuretted hydrogen, which is disengaged, it forms a good test for the presence of metallic salts.

Lime-Water. Pure lime is soluble in 680 times its weight of water, and this solution is much used in medicine under the name of lime-water; it is decomposed by exposure to air as the lime is converted into an insoluble carbonate.

Liquid, Bleaching. There are two sorts of bleaching liquid now in common use; the 1st is merely a weak solution of chlorine, and the 2nd consists of water saturated with a compound of lime and chlorine, formed by passing chlorine gas through a mixture of lime and water. The last

mentioned composition is the most esteemed, and it is commonly called *oxymuriate of lime.* *See* CHLORINE.

LIQUIDS. A name given to that class of bodies which hold the middle rank between solids and gases; their particles have free motion among themselves, and they entirely owe their fluidity to the combined caloric which they contain. If they are deprived of a sufficient quantity of caloric they become solid, and solids, by having caloric introduced into them, become liquid, or even aëriform; hence the fluidity or solidity of bodies depends entirely upon their affinity for caloric. *See* CALORIC.

The following is a table of the boiling points of sundry liquids by Fahrenheit's thermometer.

Ether	*boils at*	98°
Solution of ammonia		130°
Alcohol		176°
Pure water		212°
Nitrous acid		242°
Sulphuric acid		590°
Mercury		656°

Liquor Ammoniæ. A solution of ammonia in water. *See* AMMONIA.

Liquor Silicum, or Liquor of Flints. If pulverised flint or quartz be kept in fusion for some time with 3 or 4 times its weight of carbonate of potass or soda, a compound is formed, which, when dissolved in water, is called by the above

name; it is used as a test for acids, which decompose it, giving rise to an abundant precipitate of hydrated silica. It is properly called silicated potass.

Liquor of Libavius. A fuming compound of chlorine and tin, now called bichloride of tin. *See* TIN, CHLORIDES OF.

Litharge. A fused protoxide of lead. *See* LEAD, OXIDES OF.

Lithates. *See* URATES.

LITHIA. An alkali discovered by a young Swedish chemist in a mineral called *petalite.* It has also been found in *Spodumene* and *Lepidolite,* and it combines with the acids, of which it is capable of neutralizing a much larger quantity than either potass or soda.

The salts of lithia are of little consequence; the carbonate is sparingly soluble in water, the sulphate is more soluble and crystallizable, and the nitrate is deliquescent.

LITHIUM. A rare metal, of a white colour, much resembling sodium in its properties, and forming the base of the alkali called lithia.

LITMUS. A blue dye drug, which is used in the form of a tincture, as a test for uncombined acids, which instantly redden it. The tincture of litmus is easily prepared by digesting the solid litmus in proof-spirit, and it may be kept for any length of time in well closed bottles.

Livers of Sulphur. Alkaline or earthy sulphurets. *See* POTASS, SULPHURET OF, &c.

Load-stone. An ore of iron, which is naturally magnetic, and attracts all metallic iron to its surface; it chiefly consists of the black oxide or protoxide of the metal.

Luna Cornea, or Horn Moon. *See* SILVER, CHLORIDE OF.

Lunar Caustic. *See* SILVER, NITRATE OF, which is used in surgery, when freed from water by fusion.

Lunar Crystals. An old name for the crystallized nitrate of silver. *See* SILVER, NITRATE OF.

Lunar Muria. *See* SILVER, CHLORIDE OF.

M.

MAGISTERYS. An old name for oxides, and some other insoluble compounds of metals, when obtained in the humid way. Thus, the oxide of bismuth, precipitated by water, was called magistery of bismuth, but, when obtained in the dry way, calx of bismuth; also zinc, when precipitated by a carbonated alkali, gives a carbonate of zinc, which was nevertheless called magistery of zinc; hence, we must not suppose the word magistery only to mean oxide.

MAGNESIA; formerly *Caustic Magnesia, Anaëroxyc Magnesia, Calcined Magnesia, Magnesian Earth, Muriatic Earth, Earth of Talc, and Murioecite.*—An alkaline earth, consisting of a metallic base called magnesium combined with oxygen. It is usually obtained either by decomposing the

mother-liquor of common salt, (which consists of hydrochlorate of magnesia) or Epsom salt, which is a combination of the earth with sulphuric acid; both these decompositions are brought about by means of carbonate of potass, and the precipitate which is formed consists of carbonate of magnesia, which is readily freed from all its carbonic acid by a red heat. The magnesia thus obtained is neither acrid nor caustic, like lime; it is insoluble in water, and does not become hot when added to it. By alkalies it is not dissolved in the humid way, and it is infusible when alone, but, if mixed with silica and lime, it fuses at a strong heat.

Magnesia forms a component part of talc, soaprock, steatites, serpentine asbestus, &c., and it has been found native almost in a pure state.

Magnesia, Acetate of. A soluble compound of acetic acid and magnesia, of no use in the arts, and of little importance to the chemist.

Magnesia, Aëriated. Magnesia of Alba. *See* Magnesia, Carbonate of.

Magnesia, Anaëroxyc. An old name, signifying magnesia void of air, that is to say, deprived of carbonic acid. *See* Magnesia.

Magnesia, Black. A name formerly given to the native peroxide of manganese. *See*, Manganese, Oxides of.

Magnesia, Borate of. A native compound of boracic acid and magnesia, of no use in the arts. When it contains lime and some other im-

purities it is called *boracite;* it is insoluble in water.

Magnesia, Calcined. For a long time the carbonate of magnesia was called simply magnesia, and therefore, to distinguish the pure earth, it was called calcined magnesia. *See* MAGNESIA.

MAGNESIA, CARBONATE OF; formerly called *Aëriated Magnesia, Crude Magnesia, Magnesia Alba, or White Magnesia, Aëroxyc Magnesia.*—An insoluble compound of magnesia and carbonic acid, used in medicine as an aperient; it is easily prepared by decomposing sulphate of magnesia by carbonate of potass, and, as it parts with its carbonic acid at a red heat, it is always used for the preparation of the pure earth.

Magnesia, Caustic. *See* MAGNESIA.

Magnesia is never caustic, but nevertheless, when deprived of carbonic acid, it was called so by the old chemists.

Magnesia, Glass-Maker's. A name formerly given to the native peroxide of manganese, which is used in the manufacture of glass; it has the effect of causing all the combustible matter contained in the glass to burn with ease by the quantity of oxygen which it gives out; hence, it is also called *glass-maker's soap.* *See* MANGANESE, OXIDES OF.

MAGNESIA, HYDROCHLORATE OF; formerly called *Muriate of Magnesia, Magnesian Muria, Magnesian Salt.*—A compound of hydrochloric acid and magnesia, which is abundantly contained in

the mother-liquor of common salt; it is of no use in commerce, except for the preparation of magnesia.

The hydrochlorate of magnesia, when evaporated to dryness, becomes converted into a chloride of magnesium. *See* MAGNESIUM, CHLORIDE OF.

Magnesia, Muriate of. When in solution, HYDROCHLORATE OF MAGNESIA. *When dry,* CHLORIDE OF MAGNESIUM.

MAGNESIA, SULPHATE OF; formerly called *Epsom Salt, Vitriolated Magnesia, Cathartic Salt, and Salt of the Alps.*—A very soluble and crystallizable compound of sulphuric acid and magnesia, much used in medicine. It occurs native in many springs, especially near Epsom; it is also found in sea-water, and in certain efflorescences on the Alps. It is in great part decomposed by a red heat, and even by the heat necessary to drive off its water of crystallization it loses a part of its acid, thus being converted into a subsulphate. The sulphate of magnesia is used for the preparation of pure magnesia and its carbonate.

Magnesia, Vitriolated. See MAGNESIA, SULPHATE OF.

Magnesian Limestone. Native carbonate of lime and magnesia.

MAGNESIUM. The metallic base of magnesia, which is obtained with great difficulty. It sinks rapidly in water, producing magnesia, and is quickly changed in the air, becoming covered with a white crust of the earth.

MAGNESIUM, CHLORIDE OF. A compound of chlorine and magnesium, commonly called *dry muriate of magnesia;* it is easily obtained by evaporating a solution of the hydrochlorate of magnesia to dryness, when the hydrogen of the acid unites with the oxygen of the magnesia, forming water, and leaving a chloride of magnesium; it, however, attracts the moisture of the atmosphere, and thus is soon reconverted into a solution of the hydrochlorate of magnesia.

Malachite. A native carbonate of copper, of a beautiful light-green colour; it chiefly occurs on the continent, but also in Cornwall, and it is sometimes found crystallized, having a silky lustre, but more commonly massive.

MALATES. Saline compounds of the malic acid, which are of very little use; the alkaline malates are soluble, but those having an earth, or the oxide of lead for their base, are nearly insoluble.

MALIC ACID. *See* ACID, MALIC.

MANGANESE; formerly called *Regulus of Manganese.*—Manganese is a white, hard, brittle, metal, having a specific gravity, varying from 6.850 to 7.000; it is even less fusible than pure iron, the loadstone does not attract it when pure, but it is hardly possible to free it entirely from iron; it has a very strong affinity for oxygen, and it falls into a pulverulent oxide by exposure to air, with or without heat. Manganese is procured from its oxide with difficulty: for this purpose a quantity

of the oxide should be made into a ball with oil; this ball is put into a Hessian crucible, the rest of which is filled with charcoal powder; a cover is next luted on, and the whole is exposed to the strongest fire possible, for about an hour and a half. The manganese thus obtained decomposes water, as iron, zinc, and some other metals do; it is of no use in the arts, but it combines with oxygen, chlorine, &c., and one compound which it forms is a great article of commerce. *For a method of separating manganese from iron, see Note 10, at the end of this volume.*

Manganese has been lately found to be capable of forming two acids by its combination with different proportions of oxygen, namely, the manganeseous acid which exists combined with potass in the substance commonly called camelion mineral, and the manganesic acid which is formed when the camelion becomes red by solution in water, and exposure to the air. Hence, manganese combines with oxygen in five proportions, forming the protoxide, the deutoxide, the peroxide, and the manganeseous and manganesic acids. *See* POTASS, MANGANESITE OF.

Manganese, Calces of. See MANGANESE, OXIDES OF.

MANGANESE, CARBONATE OF. An insoluble buff-coloured compound of protoxide of manganese and carbonic acid; it occurs native as well as in chemical analysis; it contains about 49 per cent. of manganese, the rest being carbonic acid and

oxygen, and by a red heat with access of air, it is decomposed, being converted into a deutoxide having a brown colour.

MANGANESE, DEUTOXIDE OF. The oxide of manganese, containing the intermediate quantity of oxygen between that of the protoxide and the peroxide. *See* MANGANESE, OXIDES OF.

MANGANESE, ORES OF. The ores of manganese are, the oxide, the sulphuret, and the phosphate; the two first are generally of a greyish colour, sometimes having a metallic lustre; they usually contain iron, and when fused with glass of borax, they impart a violet colour to it. The phosphate of manganese also contains iron, it is of a brown colour, and is found both massive and crystallized. *For the analysis of an ore of manganese, see Note* 10, *at the end of this volume.*

MANGANESE, OXIDES OF; formerly called *Calces of Manganese.*—There are three oxides of manganese: 1st, the protoxide, which is white, and insoluble in water, but soluble in ammonia; it is obtained by decomposing hydrochlorate of manganese by an alkali, and carefully drying the precipitate under the receiver of the air-pump, as it becomes converted into a deutoxide, or even a peroxide, by exposure to air; 2nd, the deutoxide, which is of a brown colour, being obtained by exposing either the protoxide or the peroxide to a strong heat in an open vessel. It contains about 70 per cent. of the metal, and often occurs in chemical analysis; 3rd, the black peroxide, which is abundantly found in

nature, and which is the only compound of manganese of consequence in the arts. It is used by the chemist for procuring oxygen gas, (which it gives out in abundance when heated to redness); by the bleacher, for obtaining chlorine (by the decomposition of hydrochloric acid); and by the glass-blower, for rendering his glass colourless, by giving out oxygen to all the carbonaceous bodies contained in it, and thus causing their perfect combustion. One of the most striking characteristics of the oxides of manganese is, that when added in any considerable quantity to pure melted glass, they tinge it of a violet colour. Manganese also forms two acids by combination with a larger portion of oxygen. *See* POTASS, MANGANESITE OF.

Marble. A pretty pure native carbonate of lime, which always occurs massive. It is found of almost all colours, but the white being the purest, it is best adapted to chemical preparations. *See* LIME, CARBONATE OF.

Marcasites. A name formerly given to native metallic sulphurets.

Marmor Metallicum. A name formerly given to native sulphate of barytes, in consequence of its great specific gravity. *Marmor metallicum* signifies metallic marble.

Mars. An old name for iron; for the reasons of this appellation, *see* METALS.

Mascagnine. A name given by mineralogists to a native sulphate of ammonia.

Massicot. A commercial name for the yellow

protoxide of lead, which is used as a pigment. *See* LEAD, OXIDES OF.

Materia Perlata. A white oxide of antimony, prepared by detonating the metal with nitre.

Matrix. A name given to the earthy or stony part of an ore.

Matter, Amylaceous. *See* FARINA.

MATTER, COLOURING, OF BLOOD. The colour of the blood was formerly supposed to be owing to subphosphate of iron, which it was thought to contain; but it has lately been proved, by satisfactory experiments, that it is caused by a peculiar animal principle. This principle may be obtained from the coagulum of venous blood; it is insipid and inodorous, has a deep red colour, and remains unaltered by the application of a moderate heat.

MATTER, EXTRACTIVE. Extractive matter is obtained from vegetable substances; it is soluble in water and alcohol, insoluble in ether, and it is precipitated from its solutions by chlorine, hydrochlorate of tin, hydrochlorate of alumina, and subacetate of lead.

Matter, Glutinous. *See* GLUTEN.

Matter of Heat. *See* CALORIC.

MEDULLA. An insipid, inodorous substance, obtained from the pith of the *sun-flower*; by dry distillation it yields ammonia.

MECONATES. Saline compounds of meconic acid.

Mehl. An old name for the native sulphate of

lime, commonly called plaister of Paris. *See* LIME, SULPHATE OF.

Melicrates. An old name for the combinations of the malic acid, now called malates.

Menachine. A name formerly given to the native oxide of titanium.

Menstruum. A solvent. Any thing that dissolves another.

Mephitis. An old name for nitrogen, or the substance which, by its combination with caloric, forms nitrogen gas, (*mephitic gas*). *See* GAS, NITROGEN.

MERCURY. Commonly called *Quicksilver.*— A metal distinguished from all others by its fluidity at common temperatures, as it does not become solid until cooled down to about 40 degrees below 0 of Fahrenheit's scale. When it is thus solidified, it is found to be malleable and ductile, but if touched with the hand it immediately fuses, and often causes a troublesome sore, from the intense cold which it produces. If a little solidified mercury be thrown into a glass of water, it melts, while the water is frozen, and the glass is shivered to atoms.

This fluid metal is much used in the manufacture of barometers, thermometers, &c., and the mercurial-bath for receiving gases, has been the cause of many important discoveries; it is an excellent conductor of electricity and caloric, has a specific gravity of 13.6, and is usually purified by distillation, as it boils at a heat of 656°. The best

method of performing this operation in a small way, is to put the impure mercury into an earthenware retort, with $\frac{1}{8}$th of its weight of iron filings. The retort is then set in a reverberatory furnace, and made red-hot, its neck being immersed in a basin of water, and the fire is kept up until no more of the metal comes over, when the pure mercury will be found in the basin, at the bottom of the water. In this operation the iron is added to prevent the volatilization of the other metals along with the mercury, which otherwise would carry over a part of them in distillation. Mercury combines with the metals even without the assistance of heat, forming compounds commonly called amalgams; hence we have an amalgam of zinc, of lead, &c., and these amalgams are sometimes found native, often containing silver as a component part. Mercury, in a pure state, is sometimes found in nature, as also united with sulphur, chlorine, &c. It may also be artificially combined with oxygen, iodine, phosphorus, cyanogen, and fluorine, and many of these compounds are much used in medicine as well as in the arts.

It may be proper to state, that from the high price of this metal, it is often adulterated with an alloy of lead, tin, and bismuth, of which it sometimes contains a very large proportion, without having its fluidity materially decreased.

MERCURY, BICHLORIDE OF. *See* MERCURY, PERCHLORIDE OF.

MERCURY, BISULPHATE OF; formerly called

(when in solution) *Oil of Mercury.*—A compound of peroxide of mercury, with twice as much sulphuric acid as is contained in the sulphate. *See* MERCURY, SULPHATES OF.

MERCURY, BISULPHURET OF; formerly called *Cinnabar and Vermilion.*—A red compound of mercury, with twice as much sulphur as is contained in the sulphuret. *See* MERCURY, SULPHURETS OF.

Mercury, Black Oxide of. *See* MERCURY, PROTOXIDE OF.

MERCURY, CHLORIDES OF; formerly called *Muriates of Mercury.*—There are two compounds of mercury and chlorine, namely, the protochloride (commonly called *calomel*) and the perchloride, or *corrosive sublimate.* *See* MERCURY, PROTOCHLORIDE OF, *and* MERCURY, PERCHLORIDE OF.

Mercury, Corneous Ore of. An ore of mercury, consisting of chloride of mercury. *See Mercury,* PROTOCHLORIDE OF.

Mercury, Corrosive Muriate of. *See* MERCURY, PERCHLORIDE OF.

MERCURY, CYANIDE OF; formerly called *Prussiate of Mercury.*—This is a soluble and crystallizable compound of cyanogen and mercury, containing about 80 per cent. of the metal; it is formed by boiling 1 part of peroxide of mercury with 2 of cyanide of iron (*Prussian blue*), and 8 of water. The liquor is to be filtered while hot, and, on cooling, it will deposit crystals of the cyanide of mercury, which form a hydrocyanate when dis-

solved in water; they are decomposed when exposed to heat, and cyanogen is given out.

The hydrocyanate of mercury is used as a test for palladium, which it precipitates from its solutions in the form of a yellowish white cyanide; and it is particularly well adapted for this purpose, as it will not precipitate copper, iron, &c. which may also be contained in the solution.

Mercury, Dulcified. A name formerly given to the protochloride of mercury, (which has no taste) to distinguish it from the perchloride, which is very corrosive. *See* MERCURY, PROTOCHLORIDE OF.

Mercury, Fulminating. To form fulminating mercury, dissolve 100 grains of the metal (by the heat of a lamp) in a measured ounce and a half of nitric acid, of the specific gravity of 1.300, and then pour the solution, while warm, into a flask containing two measured ounces of alcohol. An effervescence will soon commence, a large quantity of the vapour of nitric ether will be disengaged, and a crystalline powder will be precipitated. It should be separated as soon as the action grows feeble, washed with pure water, and dried at a heat of about 150°. It explodes by gentle friction or heat, as also by the stroke of a hammer, and it should never be put into a bottle, lest the friction of the stopper should cause an accident.

Mercury, Horn. *See* MERCURY, CHLORIDE OF.

MERCURY, IODIDE OF. An insoluble orange-coloured compound of iodine and mercury. It

is formed by pouring hydriodate of potass into nitrate of mercury.

Mercury of Life. An old name for the deutoxide of antimony, which was thought by some to cure all diseases. *See* ACID, ANTIMONIOUS.

Mercury, Muriate of. Before hydrochloric acid was discovered to be a compound of hydrogen and chlorine, it was called muriatic acid; and, as the above preparation was supposed to be a compound of it with oxide of mercury, it was called muriate of mercury: but, since it has lately been found to consist of chlorine and the metal, it is now called protochloride of mercury. *See* MERCURY, PROTOCHLORIDE OF.

Mercury, Muriatous Oxide of. The perchloride of mercury was formerly supposed to differ from the chloride only in containing more oxygen; but, as it is found to consist of one proportional of mercury, combined with two of chlorine, while the chloride contains one of each, it is now called bichloride, or perchloride of mercury. *See* MERCURY, PERCHLORIDE OF.

MERCURY, NITRATES OF; formerly called *Mercurial Nitres.*—There are two nitrates of mercury, namely, the protonitrate, which is a compound of the protoxide, with one proportional of nitric acid, and the pernitrate, which contains the peroxide, combined with twice that quantity of acid. The former is made by dissolving mercury in cold dilute nitric acid, while the latter is obtained when a concentrated acid is used, and heat is applied to

assist the solution. Both these salts are soluble in water, and may be crystallized. They are sometimes used as tests for hydrochloric acid, with which they always give a precipitate of chloride of mercury.

Mercury, Oil of. A name formerly given to a very concentrated solution of the bisulphate of mercury. *See* MERCURY, SULPHATES OF.

MERCURY, ORES OF. Mercury occurs native in the metallic form, but its ores are few in number; the most plentiful of them is the native cinnabar, or bisulphuret of mercury; it is usually red, or of a lead grey colour, and it is the only one which is worked for the metal. Besides this there is a native chloride or muriate of mercury, and an amalgam of silver; they may all be known by their volatility before the blow-pipe, and, if heated with quicklime in a glass tube, or earthenware retort, they yield the metal in the form of globules, which sublime.

The best way of assaying any of these ores is to mix them with half their weight of lime, in an earthenware retort, placed in a reverberatory furnace. The neck of the retort should dip into water, and when at a strong red heat no more metal comes over, the operation may be suspended.

MERCURY, OXIDES OF; formerly called *Mercurial Calces.*—There are two compounds of mercury and oxygen; the black protoxide, which contains about 96 per cent. of metal, and the red peroxide, consisting of about 92½ mercury, and 7½ oxygen.

They are neither of them of much use, but the former may be obtained by boiling chloride of mercury with a solution of potass, while the latter is formed by exposing the nitrates of mercury to a heat almost approaching to a dull redness, when their nitric acid is decomposed and driven off, leaving the oxide in question; care should be taken not to have too strong a heat, as that would reduce the oxide to the metallic state, and volatilize the mercury.

Mercury, Oxymuriate of. *See* MERCURY, PERCHLORIDE OF.

Mercury, Panacea of. *See* MERCURY, PROTOCHLORIDE OF.

MERCURY, PERCHLORIDE OF; formerly called *Oxymuriate of Mercury, Muriatous Oxide of Mercury, Corrosive Muriate of Mercury, and Corrosive Sublimate.*—The perchloride or bichloride of mercury is a compound of mercury containing twice as much chlorine as the protochloride. It may be easily formed either by subliming a mixture of equal parts of pernitrate of mercury and common salt, or simply by dissolving mercury in liquid chlorine. It is a most violent poison, even when taken in very small quantities; it has, however, been used in medicine; and in the laboratory it forms an excellent test for the presence of albumen, with which it gives a white flocculent precipitate.

MERCURY, PERNITRATE OF; formerly called *Nitrated Oxide of Mercury.*—A compound of the peroxide of mercury with twice the quantity of

nitric acid contained in the protonitrate. *See* MERCURY, NITRATES OF.

MERCURY, PEROXIDE OF; formerly called *Red Precipitate per se, Red Calx of Mercury, and Perfect Oxide of Mercury.*—A compound of mercury and the largest portion of oxygen with which it can combine. *See* MERCURY, OXIDES OF.

MERCURY, PROTOCHLORIDE OF; formerly called *Muriate of Mercury, Mild Muriate of Mercury, White Precipitate of Mercury, Dulcified Mercury, Panacea of Mercury, Calomel, Horn Mercury, and Sweet Corrosive Sublimate.*—A compound of about 89½ of mercury and 10½ of chlorine. The protochloride of mercury is a most important salt in medicine; it is perfectly insoluble in water, and occurs both in nature and in chemical analysis. It is easily decomposed by a solution of potass, which leaves a protoxide of a black colour, but, if it be exposed to heat without addition it may be sublimed unaltered. It is usually prepared for medical purposes, either by subliming a mixture of two parts of perchloride of mercury with one of the pure metal, or as follows.—A quantity of moderately strong nitric acid is put into a flask standing in hot sand, and metallic mercury is added to it until no more can be dissolved, when the liquid is poured into a large quantity of hydrochlorate of soda (*solution of common salt*). The precipitate, which immediately falls, is the protochloride of mercury; it is to be well washed with pure water, and dried upon blotting-paper.

MERCURY, PROTONITRATE OF. A compound of the protoxide of mercury with nitric acid. *See* MERCURY, NITRATES OF.

MERCURY, PROTOXIDE OF; formerly called *Black Oxide of Mercury, Soluble Mercury, Imperfect Oxide of Mercury, and Æthiopis Mercurii per se.*—A compound of mercury with the least quantity of oxygen. *See* MERCURY, OXIDES OF.

Mercury, Prussiate of. *See* MERCURY, CYANIDE OF.

Mercury, Red Precipitate of. *See* MERCURY, PEROXIDE OF.

Mercury, Rose-coloured Precipitate of. A compound of mercury with phosphoric and uric acids, obtained by pouring urine into a solution of either of the nitrates of mercury.

Mercury, Soluble. A name formerly given to the protoxide of mercury, because it is easily soluble in acids.

MERCURY, SUBSULPHATE OF; formerly called *Turpith or Turbith Mineral, and Yellow Precipitate.*—A compound of oxide of mercury with a small quantity of sulphuric acid. *See* MERCURY, SULPHATES OF.

MERCURY, SULPHATES OF. If pure mercury be heated with about three times its weight of concentrated sulphuric acid until nothing but a dry mass remains, this mass, on being mixed with a large quantity of boiling water, separates into two salts, namely, the deliquescent bisulphate, which is dissolved by the water, and the insoluble

yellow subsulphate, which is sometimes used as a pigment, and was formerly called *turpith mineral, or yellow precipitate.*

MERCURY, SULPHURETS OF. If 3 parts of sulphur be melted with 1 of mercury, part of the sulphur combines with the metal, forming a sulphuret, while the rest remains in a free state; but, if the whole be afterwards sublimed by a red heat, all the sulphur combines, and a brownish bisulphuret of mercury is formed. This, when ground to fine powder, takes a beautiful red colour, and is called *vermilion.*

Mercury, White Precipitate of. *See* MERCURY, PROTOCHLORIDE OF, which is sometimes prepared in the humid way by precipitation.

METALS. A most important and numerous class of simple bodies, many of which are of late discovery. (*See their names separately.*) The old chemists called the brittle metals semi-metals, and, as they only knew seven that were not so, they distinguished them by the names of the sun, moon, and planets; thus, gold was called the Sun, silver the Moon, quicksilver Mercury, copper Venus, iron Mars, tin Jupiter, and lead Saturn.

There are at present between forty and fifty metals known to exist, but many of them are rather uncommon, being very difficult to obtain.

Metals are generally characterized by great specific gravity, opacity, fusibility, and a peculiar lustre, called the metallic lustre; they all combine with oxygen, at least in one proportion,

and many of them in three, and they also unite with chlorine, iodine, sulphur, phosphorus, and some of them with carbon. Before the theory of combustion was properly understood, metals were supposed to be compounds of certain vitrifiable calces, with an inflammable principle called phlogiston, and thus, in the oxydation of a metal by heat, it was thought to lose this phlogiston, instead of gaining oxygen, as it really does; and when this calx, or (as it is now called) oxide, was reduced by heating it with charcoal, the charcoal was said to give its phlogiston to the metallic calx to recompose the metal. *See* PHLOGISTON. *For the names of the metals now known, see Note 6, at the end of this volume.*

MICA. A mineral consisting chiefly of silica, and much resembling talc in appearance; it may, however, be distinguished from it by an elasticity which talc does not possess. Mica is found crystallized, and of various shades, of white, yellow, green, and brown.

Milk, Vinegar of. *See* ACID, LACTIC.

Mineral, Purple. *See* GOLD, STANNATE OF.

MINERALS, ALUMINOUS. Alumina next to silica, is the most abundant earth in nature; it forms the base of all clays, and those solid minerals which consist almost entirely of it, are generally very hard; they may be distinguished from other classes of minerals by the use of nitrate of cobalt, which is an excellent test for alumina. *See* Co-

BALT, NITRATE OF. The most interesting of the aluminous minerals may be described as follows.

Corundum is nearly as hard as diamond; its specific gravity is about 3.65; it is found massive and crystallized, and generally contains about 90 per cent. of alumina; for the different species of it, *see* CORUNDUM.

Fibrolite occurs in the form of small fibres; its specific gravity is 3.2, and it contains nearly half its weight of silica.

Rottenstone is of a dirty reddish brown colour; it has a fetid smell, and contains 10 per cent. of carbon.

Pinite is generally found in the form of six-sided prisms, which have a blackish or brownish colour, and contain 7 per cent. of oxide of iron.

Cyanite is generally crystallized in lamellar oblique prisms; it is hard, of a bluish or greyish colour, and has a specific gravity of 3.5.

Diaspore resembles cyanite in colour; it is found in laminæ, which decrepitate by the application of heat. It contains water.

Staurolite is found crystallized, of a greyish or reddish brown colour, and having a specific gravity of 3.30; it contains oxide of manganese, and is sometimes opake, and sometimes translucent.

Sommite much resembles native phosphate of lime; it occurs in grains, and sometimes crystallized, and it contains 2 per cent. of lime, and has a vitreous lustre.

Andalusite is of a reddish or purplish colour; it has a lamellar structure, is very hard, and contains 8 per cent. of potass.

Meionite is found in the form of eight-sided prisms; it is of a whitish or greyish colour, and its specific gravity is 3.1.

Lazulite, or Azurite, is of a beautiful blue colour, *see* AZURITE.

Blue Felspar. What is commonly called by this name differs from common *felspar* in colour and composition; it occurs in masses, which have a lamellar structure.

Wavelite crystallizes in six-sided prisms, and has a silky or vitreous lustre; it is generally of a greyish, greenish, or bluish white colour, and has a specific gravity of 2.4.

Topaz is always found crystallized, transparent, and of a greenish, bluish, or red colour; it contains fluorine, and some varieties of it become electric by heat.

Native Subsulphate of Alumina occurs in small white masses, which adhere to the tongue.

Native Alumn, which consists of potass, alumina, sulphuric acid, and water, is found in volcanic countries; it also occurs in combination with other earths in the form of *Alumn-Earth, Alumn-Stone, Alumn-Slate,* &c. &c.

MINERALS, AMMONIACAL. We have but two native compounds of ammonia, namely, the sulphate and the hydrochlorate; they may both be volatilized by heat.

Native Sulphate of Ammonia is found in Tuscany in the form of stalactites; it has a bitter taste, and is sometimes called *mascagnine.*

Native Sal Ammoniac, or *Hydrochlorate of Ammonia*, is of a brownish or greenish colour; it is decomposed by lime, and it occurs in the form of crystals or efflorescences, which are found in the neighbourhood of volcanoes.

MINERALS, BARYTIC. These minerals are distinguished by their great specific gravity and insolubility; they are used for the preparation of the earth barytes.

Witherite, or native carbonate of barytes, generally occurs massive, but sometimes in the form of hexahedral prisms, resembling crystallized quartz; it is soluble in the nitric or hydrochloric acids, and its solutions give a white precipitate with sulphuric acid. The specific gravity of native carbonate of barytes is 4.3. *See* BARYTES, CARBONATE OF.

Ponderous Spar, or native sulphate of barytes, is found massive, crystallized, and of various colours; it is sometimes opake, but often transparent, and when heated with charcoal, it is converted into a sulphuret. *See* BARYTES, SULPHATE OF.

Hepatite is a native sulphate, which gives out an odour of sulphuretted hydrogen when rubbed or heated; besides barytes and sulphuric acid, it contains lime, alumina, oxide of iron, and carbon.

MINERALS, CALCAREOUS. The minerals, con-

sisting principally of lime, are very numerous; they are generally of a whitish colour, and they often contain carbonic acid.

Carbonate of Lime occurs in various forms, and to each variety a different name is given; it is seldom very hard, and its specific gravity is between 2.5, and 3. Of the native carbonates of lime, the following are the most common, namely, *lime-stone and marble,* or massive carbonate of lime—*calcareous spar*, or crystallized and transparent carbonate of lime—*stalactites,* or stalactitic carbonate of lime, (*see* STALACTITES), *satin spar*, or fibrous carbonate of lime—*schrifer spar*, or massive carbonate of lime, having a foliated structure —*swine-stone,* or hepatic carbonate of lime, and *bituminous lime-stone,* or bituminous carbonate of lime.

Besides these, we have *oolite,* or *roe-stone,* which resembles the roe of a fish—*pea-stone,* or *pisolite,* which occurs in little round grains—*madreporite,* which is found in the form of round masses—*chalk,* which is pulverulent and earthy—*marl, or marlite,* which forms a paste with water; and *tufa,* which is very porous and irregular. The carbonates of lime all effervesce with acids, and they are easily soluble in vinegar.

Arragonite is generally of a greenish, brownish, or greyish white colour; it occurs crystallized in six-sided prisms, and various other forms; and some of it contains 2 or 3 per cent. of strontia.

Bitter Spar is crystallized in rhomboids, and

contains about 45 per cent. of carbonate of magnesia besides the oxides of iron and manganese.

Dolomite and Magnesian Lime-stone are native carbonates of lime and magnesia, containing iron, and other impurities.

Besides the calcareous minerals above mentioned, we have *apatite,* or native phosphate of lime—*pharmacolite,* or native arseniate of lime—*datholite,* or borate of lime, containing silica—*glauberite,* or sulphate of soda and lime—*gypsum and selenite,* or native sulphate of lime—*anhydrite,* or dry sulphate of lime; and *calcareous nitre,* or native nitrate of lime.

Fluor Spar, or fluoride of calcium, is found massive and crystallized; its colours are various, and, although it contains no lime ready formed, yet, as it yields the earth when decomposed, (by means of its calcium, which unites with oxygen) it is classed among the calcareous minerals.

MINERALS, CARBONACEOUS. Carbonaceous minerals are for the most part combustible; they are generally of a blackish colour, and some of them are liquid.

The Diamond consists of perfectly pure carbon in a crystalline state. *See* DIAMOND.

Mineral Carbon is of a blackish, or grey colour, it generally contains earth and iron, and it has a porous texture like wood, a silky lustre, and a specific gravity greater than that of common charcoal.

Plumbago, or native supercarburet of iron, has a

specific gravity of about 2. *See* IRON, CARBURETS OF.

Mineral Oil, Rock Oil, Petroleum, and Barbadoes Tar, all consist of naphtha, rendered impure by certain admixtures. *See* NAPHTHA.

Bitumen is generally of a brownish or blackish colour; it is combustible, and consists chiefly of carbon and hydrogen. The following are varieties of bitumen, namely, *elastic bitumen or mineral caoutchouc, compact bitumen, coal, jet,* and *pitch-coal.*

Amber is of a yellowish or reddish brown colour, and it is found in the form of round masses, which are heavier than water; when rubbed, it becomes electric, and the science of electricity derives its name from the Greek word *electron,* signifying amber. Amber is often found on the sea-side; its origin is not well understood, but it is very combustible, and may be fused without decomposition.

The Mellite, or Honey-Stone, is a carbonaceous mineral, containing above 80 per cent. of mellitic acid; it burns without smoke or flame, and leaves a residuum resembling chalk.

Fossil Copal much resembles a resin; it is of a yellowish or brownish colour, and occurs in the form of round lumps on Highgate Hill, whence it is called *Highgate Resin.*

Retinasphalt is a carbonaceous mineral, consisting of bitumen, resin, and earth.

MINERALS OF GLUCINA. *Euclase, Beryl,* and

Emerald, have sometimes been classed under the head of glucina, because they contain that earth; but, as their principal component part is silica, we have classed them with the silicious minerals.

MINERALS, MAGNESIAN. These minerals are not very numerous, nor do they contain a very large portion of magnesia; they are generally soluble in acids, and their solutions give a white precipitate with the alkaline carbonates and phosphates.

Native Hydrated Magnesia is a rare mineral, having a pearly lustre, and a specific gravity of 2.6; it is white, sometimes tinged with green, and it is found in laminæ, which often contain silica and iron.

Chrysolite occurs massive and crystallized, generally of a yellow colour, and having a specific gravity of 3.4; it contains magnesia, silica, and oxide of iron. *Olivin* is a variety of chrysolite.

Serpentine yields to the knife, it is translucent, and always massive; its colours are green, blue, yellow, and red; it is sometimes variegated, and it contains magnesia, alumina, lime, silica, iron, and water. *Potstone* and *steatite* are looked upon as varieties of serpentine.

Magnesite, or native carbonate of magnesia, is of a yellowish grey colour, and soft enough to yield to the nail; it effervesces with acids, and is best distinguished by its chemical properties.

Boracite, or native borate of magnesia, occurs crystallized; it is sometimes transparent, some-

times translucent, and often opake. The opake variety generally contains carbonate of lime.

Besides the above-mentioned minerals there is a native sulphate of magnesia, which is very soluble in water. *See* MAGNESIA, SULPHATE OF.

MINERALS OF POTASS. Several minerals contain potass, but the native nitrate is the only one which is principally composed of it; it is found in delicate fibres, which never occur far beneath the surface of the earth. *See* POTASS, NITRATE OF.

MINERALS, SILICIOUS. The compact silicious minerals are generally very hard, and many of them contain the earth nearly in a state of purity; they are insoluble in all acids except the hydrofluoric, but, if fused with three times their weight of potass, they become soluble in water, and the solution gives a white precipitate of hydrated silica when mixed with an acid.

Quartz is found crystallized, massive, pseudomorphous, spongiform, granular, and fibrous; its colours are various; it is found transparent and opake, and when colourless and crystallized, it is called *rock crystal*, and *Bristol or Cornish diamond*. That which has a purple or violet-colour is named *amethyst*, but, when yellow, it is called *false topaz*. Quartz has a specific gravity of 2.6; it is hard enough to scratch glass, and it consists of silica and water, with some impurities; *avanturine, swimming-stone, hyalite*, &c., are varieties of

quartz, and *prase* is a compound of quartz and actinolite.

The six minerals following contain silica, alumina, oxide of iron, and water.

Black Chalk soils the fingers, is of an earthy texture, and of a blackish colour.

Chalcedony occurs massive, crystallized, stalactitic, and pseudomorphous; it is white, brown, green, or yellow, its specific gravity is 2.6, and its hardness is greater than that of flint; *heliotrope, oriental jasper or blood-stone, sard, plasma,* and *carnelian,* are all varieties of this mineral, and *agate, jasper,* and *onyx,* are varieties of sard.

Cimolite is greyish or reddish, and its specific gravity is 2. It occurs massive, and somewhat resembles slate.

Flint is a well known mineral; it scratches glass, and its specific gravity is 2.58.

Menilite is brown, of a slaty texture, translucent, and has a specific gravity of about 2.5. *Pitchstone* is a variety of it.

Opal and Hydrophane consist of silica, alumina, water, and sometimes oxide of iron; they are of various colours, and occur opake, transparent, translucent, and massive.

Almandine, or Precious Garnet, contains oxide of manganese; its colour is red, it has a specific gravity of 4.3, and occurs granular, massive, and crystallized.

Tabular Spar contains nearly half its weight of

lime; it generally occurs white or blue, having a lamellar structure.

Steatite contains magnesia; it is white, grey, green, yellow, or red, and occurs both massive and pseudomorphous; it has an unctuous feel, and is very abundant in China.

Bronzite resembles bronze; its specific gravity is 3.2.

Laumonite occurs in crystalline masses; it contains carbonic acid, and its specific gravity is 2.2.

Cat's Eye is of various colours; it takes its name from the resemblance it has to a cat's eye.

Stilbite is white, grey, brown, or red, and has a peculiar pearly lustre.

Garnet contains a large quantity of oxide of iron; its colours are red, yellow, brown, or green; it is found crystallized, and is generally opake.

Tripoli is an earthy-looking mineral, which yields to the nail; it is generally massive, grey, and pulverulent, and it is used for polishing metals.

Bole or Ochre resembles tripoli in its texture; it is of a brown red, or yellow colour, and forms a paste with water. It contains 65 per cent. of silica, and its varieties are *bistre, red chalk, bole armenic,* and *loam.*

Clay is generally brown, grey, or red; it is a well known substance, and consists chiefly of silica and alumina. Clay forms a paste with water, and in this state it is much used as a lute.

Tourmalin is often found green, but it also occurs black, brown, blue, and yellow; it is not

quite so hard as quartz, and it contains oxide of manganese. Tourmalin has a splendent or vitreous lustre, and it occurs massive and crystallized.

Lapis Lazuli, or Azure-Stone, is massive, and of a fine azure blue colour; it scratches glass, has a specific gravity of about 2.8, and often occurs enclosing pyrites or quartz.

Egyptian Pebble occurs in round masses, is of a brown colour, and has a specific gravity of 2.5.

Asbestus is generally of a fibrous texture, resembling thread; it is very flexible, generally white or brown, and it contains 59 per cent. of silica.

The following are varieties of it, which chiefly differ in texture and outward appearance, *amianthus, mountain cork or leather*, and *ligniform asbestus or mountain wood.*

Basaltic Hornblend is generally black, opake, and crystallized; it has a vitreous lustre, and a specific gravity of 3.25.

Potstone, in outward appearance, resembles massive talc; it contains less silica and alumina.

Mica is a very abundant mineral, having a pearly lustre, and being easily divided into thin laminæ; it occurs of various colours, crystallized and massive, and it much resembles talc, but may be distinguished from that mineral by an elasticity which talc does not possess. Mica contains potass.

Pumice is a well-known porous mineral, containing 3 per cent. of potass and soda; it has a pearly lustre, and floats upon water.

Talc is white, green, or yellow; it very much resembles mica, but is distinguished from that mineral by its want of elasticity; talc contains potass, and has a specific gravity of 2.8.

Spodumene is a rare silicious mineral; it sometimes contains lithia.

Felspar is crystallized, of a lamellar structure, has a specific gravity of 2.6, and becomes phosphorescent when rubbed. It is often of a dark colour, and its varieties are *adularia, moon-stone, sanidin,* and *Labrador felspar.* Felspar usually contains potass.

Lepidolite, or Lilatite, consists of flexible scales, which are translucent; it has a pearly lustre, and is generally of a grey red, or lilac colour; its specific gravity is 2.85, and it contains fluoride of calcium *(fluate of lime).*

Lava is of a green, black, or grey colour, generally opake, but differing in its component parts; some lava contains soda.

Pitchstone obtained its name from its resemblance to pitch; it contains oxide of manganese and soda, and has a specific gravity from 2.3 to 2.6.

Clinkstone obtained its name from the sound it gives when struck with a hammer.

Sodalite is of a light-green colour; it is very scarce, occurs massive and crystallized, and contains 23 per cent. of soda.

Jade is always massive, has a greasy lustre, and is generally of a greenish colour; *axe-stone or*

beilstein, and *saussurite or tough felspar*, are varieties of it.

Soapstone resembles soap in its feel and appearance.

Basalt is of a dark colour, and very hard. The Giant's Causeway consists entirely of it.

The following is a list of the less interesting silicious minerals, with their specific gravities, and the proportions of their component parts affixed.

	Spec. Grav.	Constituents.
Jenite	3.8	Silica 29, lime 12, oxides of manganese and iron 57.
Dipyre	2.7	Silica 60, alumina 24, lime 10, water 2.
Prehnite	2.8	Silica 48, alumina 24, lime 23, oxide of iron 4.
Zoysite	2.6	Silica 44, alumina 32, lime 20, oxide of iron 2.5.
Idocrase, Vesuvian, or Brown Volcanic Hyacinth	3.3	Silica 35.50, alumina 33, lime 22.25, oxide of iron 7.50.
Cinnamonstone	3.6	Silica 38.8, alumina 21.2, lime 3.25, oxide of iron 6.5.
Porcellanite	3.2	
Melanite		Silica 35, alumina 6, lime 32, oxide of iron 25.
Aplome		Silica 40, alumina 20, lime 14.5, oxide of iron 14.5, oxide of manganese 2.
Thallite	3.45	Silica 37, alumina 21, lime 15, oxide of iron 24, oxide of manganese 1.5.
Wernerite		Silica 40, alumina 34, lime 16, oxide of iron 8, oxide of manganese 1.5.

	Spec. Grav.	Constituents.
Axinite	3.2	Silica 44, alumina 18, lime 19, oxide of iron 14, oxide of manganese 4.
Allocroite		Silica 35, alumina 8, lime 30.5, oxide of iron 17, oxide of manganese 3.5, carbonate of lime 6.
Tremolite	3	Silica 62.2, lime 14.1, magnesia 12.9, oxide of iron 5.9, water 1.
Meerschaum		Silica 50.5, magnesia 17.25, lime 0.5, carbonic acid 5, water 25.
Anthophyllite	3.3	Silica 62.66, alumina 13.33, magnesia 4, oxide of iron 12, oxide of manganese 3.25, water 1.43.
Harmotome	2.35	Silica 49, alumina 16, barytes 18, water 15.
Hypersthene	3.38	Silica 54.25, alumina 2.25, lime 1.5, magnesia 14, oxide of iron 24.5, water 1.
Schiller Spar	3.1	Silica 41, alumina 3, lime 1, magnesia 29, oxide of iron 14, water 10.
Augite	3.3	Silica 52, alumina 3.3, lime 13.2, magnesia 10, oxide of iron 14.6, oxide of manganese 2.
Pyrope	3.8	Silica 40, alumina 28.5, lime 3.5, magnesia 10, oxides of iron and manganese 16.75.
Smaragdite		Silica 38, alumina 7, magnesia 35, iron 15, and a minute portion of fluoride of calcium.
Actinolite	3.3	Silica 50, alumina 0.75, lime 9.75, magnesia 19.25, oxide of iron 11, oxide of chromium 5, water 3.
Colophonite	2.5	Silica 35, alumina 15, lime 2.9, magnesia 6.5, oxide of iron 7.5, oxide of manganese 4.75, oxide of titanium 0.5.

	Spec. Grav.	Constituents.
Leucite		Silica 53.75, alumina 24.62, potass 21.35.
Lithomarga		Silica 45, alumina 36, iron 3, water 14, and a little potass.
Mesotype	2	Silica 49, alumina 27, soda 17, water 9.5.
Rubellite		Silica 42, alumina 40, soda 10, oxide of manganese and iron 7.
Fish-eye-Stone	2.46	Silica 51, lime 28, potass 4, water 7.
Green Earth		Silica 53, magnesia 2, potass 10, oxide of iron 28, water 6.
Spodumene	3.2	Silica 64.4, alumina 24.4, lime 3, potass 5, oxide of iron 2.2.
Nacrite		Silica 50, alumina 26, lime 1.5, potass 17.5, oxide of iron 5, and a small quantity of chlorine.
Pearlstone	2.34	Silica 75.25, alumina 12, lime 4.5, potass 4.50, oxide of iron 1.6, water 4.5.
Agamatolite		Silica 56, alumina 29, lime 2, potass 7, oxide of iron 1, water 5.
Obsidian	2.35	Silica 78, alumina 10, lime 2, potass 6, oxide of iron 1, manganese 1.
Latialite	3.2	Silica 30, alumina 15, sulphate of lime 20.5, lime 5, potass 11, oxide of iron 1, water 17.5, sulphuretted hydrogen and loss.
Analcime	3	Silica 58, alumina 18, lime 2, soda 10, water 8.5.
Chabasie	2.7	Silica 43.33, alumina 26.6, lime 3.34, potass and soda 9.34, water 21.
Fettstein	2.6	Silica 44, alumina 34, lime 12, potass and soda 16.5, oxide of iron 4.

	Spec. Grav.	Constituents.
Scapolite		Silica 45, alumina 33, lime 17.6, potass 0.5, soda 1.5, oxides of iron and manganese 1.
Chlorite	2.56 to 3	Silica 26, alumina 18.5, magnesia 8, chloride of sodium or of potassium 2, and oxide of iron 43.
Schorl	3.2	Silica 38, alumina 34, magnesia 1, potass 6, oxide of iron 21.
Clay-Slate	2.7	Silica 48, alumina 23.5, magnesia 1.6, oxide of iron 11.3, oxide of manganese 0.5, potass 4.7, carbon 0.3, water 7.6.
Gabronite	3	Silica 54, alumina 24, magnesia 1.5, potass and soda 17.25, oxides of iron and manganese 1.25, water 2.
Fuller's Earth		Silica 53, alumina 10, lime 0.5, magnesia 1.25, oxide of iron 9.5, chloride of sodium 1, water 24.
Euclase		Silica 35, alumina 18, Glucina 14, oxide of iron 2.
Beryl		Silica 68, alumina 15, glucina 14, lime 2, oxide of iron 1.
Emerald		Silica 64.5, alumina 16, Glucina 13, oxide of chromium 3.25, lime 1.6.

The exact analyses of the following minerals have not yet been made, but, as they are supposed to consist chiefly of silica, they are classed with the silicious minerals, *hornstone, chiastolite, spinellane, mellilite, wacke, slate-clay or shale, flinty slate,* of which *basanite* is a variety, and *whet-slate.*

MINERALS, SODAIC, OR MINERALS OF SODA. These minerals are not numerous; they are all

soluble in water, and their solutions may be crystallized by evaporation.

Trona and *Natron* are native carbonates of soda; the former comes from Africa, and it is the purest; the latter is found on the banks of certain lakes in Egypt; it consists of carbonate of soda 32, sulphate of soda 21, chloride of sodium 15, and water 32, and it is sometimes called *salt of the lakes.* Native carbonate of soda is also found in certain hot springs.

Native Sulphate of Soda occurs in the form of a greyish white powder, which has a bitter taste; it is also found in mineral waters.

Native Subborate of Soda is found in certain lakes in Thibet; it is generally very impure.

Rock-Salt, or Common Salt, consists of chlorine and sodium, but it sometimes occurs in solution, when it is really a hydrochlorate *(muriate)* of soda; it is easily recognised by its taste. *See* SODIUM, CHLORIDE OF.

MINERALS, STRONTITIC. We have two native salts of strontia, which form this class of minerals, namely, the sulphate and the carbonate; they are insoluble in water, and have a great specific gravity.

Strontianite, or native carbonate of strontia, is, at present, a very rare mineral; it has a yellowish white or green colour, and is found in Scotland; its specific gravity is 3.67, and it generally occurs in radiated masses.

Celestine is a native sulphate of strontia, it ob-

tained its name from its often possessing a light-blue colour; it occurs massive, fibrous, and crystallized, is very abundant near Bristol, and has a specific gravity of 3. *See* STRONTIA, &c.

MINERALS OF THORINA. The only minerals which contain thorina are *gadolinite*, and a native fluoride of cerium, and a fluoride of cerium and yttria.

Gadolinite contains more yttria than thorina; and hence it is classed with the minerals of yttria.

MINERALS OF YTTRIA. The only minerals which contain yttria are the yttrotantalite and the gadolinite.

The Yttrotantalite has a shining metallic lustre, and is nearly black; it has a specific gravity of 5.1, and it consists of oxide of tantalium 45, and yttria and oxide of iron 55.

Gadolinite is of a greenish or brownish colour, slightly translucent, massive, and crystallized; it is hard enough to scratch glass, and it consists of yttria 54.75, silica 21.25, glucina 5.5, alumina 0.5, oxide of iron 17.5, water 0.5, and a slight trace of manganese.

MINERALS OF ZIRCONIA. There are three minerals, which chiefly consist of zirconia.

Hyacinth contains 70 per cent. of zirconia; it is of a red colour, transparent or translucent, and having a lamellar structure. Besides zirconia, it contains silica and oxide of iron.

Jargoon occurs in the form of small crystals, which are sometimes translucent, and sometimes

transparent; it is grey, yellow, brown, or red, and it contains 66 per cent. of zirconia.

Zirconite is a mineral of a brownish red colour; it contains 64 per cent. of zirconia, and 1 of oxide of titanium; it is very hard, and occurs crystallized.

Mineralizers. Those substances, which are combined with metals in their ores; thus, sulphur is the mineralizer of iron in pyrites.

Minium. The commercial name for the deutoxide of lead.

MIXTURES, FREEZING. These are saline compounds, which, on solution in water, produce great cold, as in passing from the solid to the liquid form, they combine with a large quantity of caloric, or matter of heat, which they take from the surrounding bodies.

Table of Freezing Mixtures.

Mixtures.		Thermometer.	Degree of Cold produced.
Phosphate of soda	5 parts	From 0 to 34 below zero.	34.
Nitrate of ammonia	3		
Diluted nitric acid	4		
Snow	3 parts	From 0 to 46	46.
Diluted nitric acid	2		
Snow	2 parts	From any temperature to 5°.	
Common salt	1		
Hydrochlorate of ammonia	5 parts	From 50° to 10°	40.
Nitrate of potass	5		
Water	16		
Sulphate of soda	8 parts	From 50° to 0°	50.
Hydrochloric acid	5		

The meaning of the thermometer (as in the first mixture) sinking from 0 to 34 is, that the materials must be reduced to 0 by other mixtures before they are made use of. The same rule is to be observed throughout.

For the purpose of making freezing mixtures the salts used should be well crystallized, and separately reduced to fine powder, and the materials should be mixed as expeditiously as possible in thin vessels, formed of some non-conducting substance.

Molybdænocrates. *See* MOLYBDATES.

MOLYBDATES; formerly called *Molybdænocrates.* A class of salts formed by the combination of molybdic acid with alkalies, &c. They are of no consequence, never having been applied to any use.

Molybdena. A native sulphuret of the metal called molybdenum. It was for some time confounded with the native supercarburet of iron, commonly called plumbago.

MOLYBDENUM. A rare brittle metal, of which very little is known. It is extracted from the ore called molybdena; in colour it resembles silver, and it is so infusible, that it can never be obtained in a perfect button. It combines with oxygen in three proportions, forming the oxide and the molybdous and molybdic acids; it also forms alloys with other metals, but its combinations have never been applied to any use.

MOLYBDENUM, OXIDE OF. Molybdenum com-

bines with oxygen in three proportions, forming two acids and an oxide; this latter forms salts with acids, while the molybdic and molybdous acids form salts with alkalies.

Moon. An old name for silver. *See* METALS.

Mordants. Substances used in dying to give the cloth an affinity for the dye.

MORPHIA. Morphia is a vegetable alkali, obtained from a strong infusion of opium, in which it is combined with the meconic acid. It is white, crystallizable, and very soluble in water. It forms the narcotic principle of opium, and is used in medicine, when combined with the acetic or sulphuric acids. Morphia consists of hydrogen, oxygen, and carbon; and, if exposed to a gentle heat, it melts and crystallizes on cooling, but at a strong heat it burns and is decomposed, leaving a black resinous matter, with a peculiar smell.

Mother Waters. A name given to those deliquescent saline residues which remain after the crystallization of certain salts.

MUCATES; formerly called *Saccholactates* and *Gummicrates.* — Compounds of the mucic acid with alkaline bases.

The mucates of potass, soda, and ammonia, are very soluble in water, but those of barytes, lime, magnesia, and the metals, are generally almost insoluble.

MUCILAGE. That substance which exudes from trees, and is commonly called *gum;* it may be obtained in a solid form, and it is transparent,

but not crystallizable. It is very soluble in water, but insoluble in alcohol, and that which is considered the purest, is sold under the name of *gum arabic*. If an aqueous solution of mucilage be mixed with subacetate of lead, a precipitate takes place, which Berzelius calls gummate of lead.

Mucus. Mucus is an animal substance, obtained in a solid form, by evaporating saliva to dryness; it may also be obtained from the liquid in which an oyster has been macerated. It resembles gum or mucilage in its appearance and properties, but, when obtained in a solid form, it is more opake.

Murias. An old name for that class of salts now called HYDROCHLORATES.

Muriates. A name given to that class of salts now called hydrochlorates, when the hydrochloric acid was supposed to consist of a base called muriatium with oxygen; but this acid being found to be composed of hydrogen and chlorine, it is classed among the hydrogen acids, and its combinations with alkalies, &c., are called hydrochlorates.

Muriatium. A supposed simple body, which was formerly thought to form hydrochloric (*muriatic*) acid by its combination with oxygen. *See Acid, Muriatic*.

Murioecite. An old name for the earth now called magnesia.

MYRICIN. A name given to that part of wax

which is insoluble in alcohol. It is soluble in fixed and volatile oils, and fuses at 120°.

N.

NAPHTHA. A combustible liquid, having a yellowish colour. It is very light when pure, its specific gravity being only about 0.7; it occurs in springs near the Caspian Sea, has a bituminous smell, boils at about 320°, and is said to consist entirely of hydrogen and carbon, with a minute portion of nitrogen; hence, its containing no oxygen renders it useful in the preservation of potassium.

Naphtha exudes spontaneously from clefts in rocks; it is generally found in warm countries, but sometimes in Great Britain, and it may be obtained by the dry distillation of coals and other bituminous minerals. Very good Naphtha is found in Italy, and, when impure, it is often called *petroleum*, or *rock oil;* that which comes from Barbadoes has obtained the name of *Barbadoes tar*.

Naphtha, Sulphuric. A name formerly given to what is now called sulphuric ether. *See* ETHERS.

Naphthas, Vegetable. *See* ETHERS.

Naples Yellow. A yellow pigment, consisting of oxide of lead, oxide of tin, and potass.

Natron. A name formerly given to a native impure carbonate of soda found in Egypt, from which soda and its salts were often prepared.

Hence, the old chemists make use of the term natron, to signify soda, and natrous salts for salts of soda. *See* SODA, *and* SODA, CARBONATES OF.

Natron, Prepared. & *Natrous Aërocrate.* Old names for carbonate of soda. *See Natron, and* SODA, CARBONATES OF.

NICKEL. Nickel is a malleable metal, of a yellowish or reddish white colour, having a specific gravity, varying from 8.279 to 8.666. It is attracted by the magnet, and, like iron, it may itself be converted into a magnet. It is found native, but never in a pure state, as it is rendered brittle by the presence of arsenic, for which it has a great affinity. The following is the method advised by Dr. Thomson, for obtaining pure nickel. Dissolve the metal in a mixture of sulphuric and nitric acids, and evaporate the solution to crystallize the sulphate of nickel formed. Separate these crystals, dissolve them in water, and crystallize a second time, decompose them by an alkali, and mix the pure oxide obtained with 3 per cent. of resin, and some oil, and expose the whole to a most violent heat in a crucible lined with charcoal, when a button of pure nickel will be obtained.

Pure nickel is very difficult of fusion, but it absorbs oxygen when heated to redness in atmospheric air; it also unites with chlorine, iodine, sulphur, phosphorus, and cyanogen; and its oxide combines with the different acids.

NICKEL, CHLORIDE OF; formerly called *Dry Muriate of Nickel.*—A compound of chlorine and

nickel, which, when dissolved in water, becomes converted into a hydrochlorate or muriate of the oxide of nickel.

NICKEL, HYDROCHLORATE OF. A compound of oxide of nickel with hydrochloric acid, which can only exist combined with water; for, when deprived of it, a chloride of nickel results.

Nickel, Muriate of. *See* NICKEL, HYDROCHLORATE OF.

NICKEL, ORES OF. Nickel occurs native, combined with a small portion of arsenic, sulphur, and cobalt, from which it is very difficult to free it in the dry way. In this state it is called by the Germans kupfernickel, but it is also found combined with sulphur, oxygen, and iron, forming what is called the black ore of nickel, and nickel ochre.

NICKEL, OXIDES OF; formerly called *Calces of Nickel.*—If nitrate of nickel be decomposed by potass, a hydrated protoxide of a green colour is thrown down, and this, when heated to redness, affords a pure grey protoxide, containing about 79 per cent. of the metal; but, if the hydrated protoxide be mixed with water, and chlorine be passed through the mixture, a black peroxide is formed, which cannot unite with acids without giving out a part of its oxygen, as it is the protoxide which forms all the salts. The oxides of nickel have never been applied to any use.

NICKEL, SULPHATE OF. A compound of sulphuric acid and protoxide of nickel, easily formed

directly from its two component parts, or by boiling metallic nickel in a mixture of nitric and sulphuric acids, and crystallizing the salt formed. It is of a fine light-green colour, but has not been applied to any use in the arts.

NICKEL, SULPHURET OF. A white brittle compound of sulphur and nickel, which is abundantly found in nature.

NICOTIN. A peculiar vegetable principle obtained from *tobacco*. It is colourless, volatile, and soluble in water and alcohol.

Nihilum Album. A name formerly given to the oxide of zinc, because when mixed with charcoal, and exposed to heat in a crucible, it gives no button of metal, as the heat evaporates the zinc.

NITRATES; formerly called *Nitres, and Nitrous Salts.*—A name given to that class of salts formed by the combination of nitric acid with salefiable bases. Their chief characteristics are solubility in water; giving out oxygen when heated to redness, leaving a nitrite; and by a still stronger heat losing all their acid, while nothing but their alkaline base remains. They detonate violently when heated to redness with charcoal, and a carbonate of their base is invariably formed.

Nitre. See POTASS, NITRATE OF.

Nitre, Cubic or Rhombic. A name formerly given to the nitrate of soda from the form of its crystals.

Nitre, Fixed. A name formerly given to a carbonate of potass, prepared by detonating a mix-

ture of charcoal and nitrate of potass in a red-hot crucible, and lixiviating the residuum. The salt which dissolves in the water is carbonate of potass.

Nitre, Flaming. *See* AMMONIA, NITRATE OF, which flames when thrown on burning coals.

Nitre, Ponderous. *See* BARYTES, NITRATE OF.

Nitre, Quadrangular. *See* SODA, NITRATE OF, which crystallizes in cubes.

Nitre, Vitriolated. A more or less acidulous sulphate of potass, obtained from the residuum of the distillation of nitric acid.

Nitres. *See* NITRATES.

NITRITES. Salts formed by exposing the nitrates to a red heat; they are compounds of the nitrous acid, but become again converted into nitrates by long exposure to air. They cannot be formed by mixing nitrous acid with a base, but only by exposing the nitrates to heat.

NITROGEN. That simple body which by its combination with caloric forms what is called nitrogen gas. It can never be exhibited in a perfectly simple state as when disengaged from its combinations, it immediately combines with caloric, and becomes gaseous; but it exists in a solid form in almost all animal substances, as also in the different nitrates, the acid of which is a compound of nitrogen and oxygen. It combines with oxygen in four proportions, forming the two oxides of nitrogen, and the nitrous and nitric acids; it also unites with hydrogen, forming ammonia,

and with chlorine and iodine. *See* GAS, NITROGEN.

NITROGEN, CHLORIDE OF. Although nitrogen and chlorine do not unite by simple mixture, yet, if chlorine gas be passed into a solution of nitrate of ammonia, decomposition takes place, and the chlorine unites with the nitrogen of the ammonia. The compound in question, which appears first like a thin film on the surface of the liquid, resembles an oil, and detonates by a gentle heat with such violence as to render it unsafe to operate upon a quantity exceeding that of a grain of mustard-seed. It also explodes if brought in contact with any oleaginous substance; it has a specific gravity of about 1.653, and it consists of four volumes of chlorine and one of nitrogen gases, condensed into a fluid.

NITROGEN, IODIDE OF. A dangerous compound of nitrogen and iodine. Its properties much resemble those of the chloride of nitrogen.

NITROGEN, OXIDES OF. There are two gaseous compounds of nitrogen and oxygen, not containing enough of the latter to render them acid, and hence they are called the protoxide and per oxide of nitrogen. The protoxide is easily obtained by exposing nitrate of ammonia to the heat of a lamp, in a glass retort, and receiving the gas over water, by which it is but sparingly absorbed. The peroxide or nitrous gas is always disengaged, when metals are dissolved in nitric acid; it again

combines with oxygen, and becomes converted into nitrous acid, by the presence of atmospheric air. The protoxide may be respired for some minutes, when it produces sensations similar to those of intoxication, and to some people it is particularly delightful, but on others it has a contrary effect, causing great depression, and all the symptoms of suffocation.

NITROGEN, PEROXIDE OF; formerly called *Nitric Oxide and Nitrous Gas.*—A gaseous compound of nitrogen and oxygen, containing as large a portion of this latter as it can combine with without being acidified. *See* NITROGEN, OXIDES OF.

NITROGEN, PROTOXIDE OF; formerly called *Nitrous Oxide,* and *Phlogisticated Nitrous Air. See* NITROGEN, OXIDES OF.

Nitrum Tabulatum. An old name for nitrate of potass.

Nitrum Vitriolatum. A name formerly given to a more or less acidulous sulphate of potass, obtained from the residuum of the distillation of nitric acid.

O.

OCHRE. An ore of iron, consisting of the metal combined with oxygen, carbonic acid, and alumina. *See* IRON, ORES OF.

Octahedrite. An ore of titanium, containing the metal in the state of an oxide; it obtained the name of octahedrite from the form of its crystals.

Oetites. An ore of iron consisting of the oxide combined with stony matter; it is commonly called *clay-ironstone.*

Oil of Wine. A peculiar volatile oily fluid, which is formed during the distillation of alcohol with sulphuric acid, and comes over towards the end of the process. It is said to be a good solvent for caoutchouc.

Oils. Compound substances, sometimes solid, but usually fluid at common temperatures. They are nearly insoluble in water, and some of them are volatile, and soluble in alcohol, while others are fixed. Oils occur both in the animal and vegetable kingdoms; and they are all combustible, and are divided into two classes, namely, volatile oils and fixed oils. *See* Oils, Fixed, *and* Oils, Volatile.

Oils, Distilled. Oils, Essential. Oils, Etherial. See Oils, Volatile.

Oils, Expressed. Oils, Fat. See Oils, Fixed.

Oils, Fixed; formerly called *Mild Oils, Fat Oils, and Expressed Oils.*—A name given to those oils which are obtained from vegetable and animal substances, and cannot be volatilized without decomposition. Those of vegetable origin are much used in the arts under the name of drying oils, and they are rendered fit for the use of the painter by boiling them for some time with a small quantity of dry protoxide of lead, commonly called *litharge.* They are also used for burning in lamps, and an infinity of purposes, which it is needless

here to describe. Fixed oils are insoluble in water and alcohol, but with alkalies they form soluble compounds, commonly called *soaps.*

Oils, Metallic. A name formerly given to concentrated solutions of metals in acids, because some of them have an oleaginous consistency.

Oils, Mild. *See* OILS, FIXED.

Oils, Scented. *See* OILS, VOLATILE.

OILS, VOLATILE; formerly called *Essences, Essential Oils, Etherial Oils, and Distilled Oils.*—Volatile oils are usually obtained from plants, by distilling them with water, as they are carried over with that fluid, but are sparingly soluble in it. *Lavender-water, Eau de Cologne,* &c. are merely solutions of volatile oils in alcohol, but *rose-water, Rosemary-water,* and some others, consist of water impregnated with the oils. *See Waters, Distilled.*

Volatile oils are very combustible, and many of them are inflamed by pouring strong nitrous acid on them; they have a hot taste, and unite with alcohol in all proportions, but are again separated from it by mixture with water.

OPAL. A very hard silicious mineral, containing oxide of iron, water, and sometimes ammonia, and a small portion of bitumen.

Opium. A vegetable substance, from which the alkali, called morphia, is extracted.

ORES. Those natural compounds of metals which are found in, or on the surface of the earth. They usually consist of the metal combined with

sulphur, arsenic, oxygen, chlorine, or earths, and sometimes acids. *See the different metals and their ores.*

Orpiment, Red. A native compound of arsenic and sulphur. *See* ARSENIC, SULPHURET OF.

Orpiment, Yellow. A native compound of arsenic and sulphur, differing from the red orpiment only in colour. *See* ARSENIC, SULPHURET OF.

OSMAZOME. A peculiar animal principle, of a brownish yellow colour; it is soluble in water and alcohol, and forms precipitates with the infusion of nut galls, and the nitrates of lead and mercury.

OSMIUM. A metal found in the ore of platinum, having a dark grey colour. It is almost infusible, but when heated in the air it is oxydated, giving out a peculiar smell, which is a characteristic of the metal. Its oxide is soluble in water, has a sweet taste, and when combined with potass, it forms an orange-coloured solution in water; it also stains the skin of a permanent dark colour. Osmium is not soluble in any of the acids, but its oxides form peculiar salts with them. Neither the metal nor its combinations are of any use. *For a method of obtaining osmium, see Note* 14, *at the end of the volume.*

OSMIUM, ALLOY OF. A natural compound of iridium and osmium, found accompanying native platinum in the form of grains, which have a specific gravity of about 19.5.

OXALATES; formerly called *Oxalidicrates, and*

Saccharates.—A peculiar class of salts formed by the combination of oxalic acid with alkaline bases. They are all decomposed by a red heat, their acid being burnt; they are some of them soluble in water, but those composed of earths, the oxide of lead, &c., are generally insoluble.

Oxalidicrates. *See* OXALATES.

Oxide, Carbonic. *See* CARBON, OXIDE OF.

OXIDE, CISTIC. A peculiar insoluble substance, of a brownish yellow colour, which is found in the form of a *calculus* in the human bladder. It is rather tough, has a greasy lustre when cut, and it forms soluble and crystallizable compounds with acids and alkalies, but has no effect on vegetable blues. It is also called RENAL OXIDE, as it is generated in the kidneys, and not in the bladder.

Oxide, Nitric. *See* NITROGEN, PEROXIDE OF.

Oxide, Nitrous. *See* NITROGEN, PROTOXIDE OF.

Oxide, Stibic. A name given by Berzelius to the compound of antimony and oxygen, generally called antimonic acid. *See* ACID, ANTIMONIC.

Oxide, Stibious. A name given by Berzelius to the antimonious acid or deutoxide of antimony. *See* ACID, ANTIMONIOUS.

OXIDES. Whenever a substance is combined with oxygen, but, at the same time, does not contain enough of it to give it acid properties; the compound formed is called an oxide, and, if the substance in question form two or three com-

pounds with oxygen, that containing the smallest portion is called a protoxide, the next a deutoxide, and the one containing the largest quantity a peroxide, sometimes, between these, we have what is called a tritoxide. Thus, there is a protoxide and a peroxide of nitrogen, an oxide of carbon, &c.

Oxides, Metallic; formerly called *Metallic Calces, Metallic Ashes, and Burnt Metals.*—A numerous and interesting class of compounds, consisting of oxygen, or the base of oxygen gas, combined with metals. Many of them are remarkable for their brilliant colours; they are generally insoluble in water, but every metal has one oxide which is soluble in acids.

Metallic oxides are for the most part reducible by heating them with charcoal, but some of them require peculiar management. *See Note 2, at the end of this volume.*

Oxycrates. An old name for Acetates.

Oxygen. That simple substance, which by its combination with caloric forms oxygen gas. It can never be obtained in an insulated state, as its affinity for caloric is so great, that as soon as it is disengaged from any of its compounds, it assumes the gaseous form. To this is owing the heat given out in combustion and respiration, for here the oxygen unites in the first instance with the combustible, and in the second with the blood; and its caloric, which before kept it in the gaseous state, is set free, and thus rendered sensible. With

metals, and many other substances, it forms compounds called oxides. *See* GAS, OXYGEN.

Oxymuriates. Chlorides of salefiable bases. Thus, we have a chloride of lime, which was formerly called *oxymuriate of lime;* for the reasons of this change, *see Acid, Oxymuriatic.*

P.

PALLADIUM. Palladium is a white malleable metal, having a specific gravity from 11.0 to 12.0, and much resembling platinum, from the ore of which it is obtained in the following manner.—A quantity of the crude platina is digested in a mixture of nitric and hydrochloric acids, which acts on it by virtue of its chlorine, and the solution obtained is precipitated by hydrocyanate of mercury. The precipitate, when washed, dried, and strongly heated, consists of pure palladium. It has but little elasticity, and when broken, it presents a crystalline texture. It is soluble in chlorine, and it unites with oxygen, &c., but, having never been obtained in any quantity, it is not applied to any use.

PALLADIUM, OXIDE OF. If a solution of palladium in chlorine be decomposed by potass, a brown oxide of palladium is formed. It is soluble in acids, and according to Berzelius, it consists of palladium 87.56, oxygen 12.44.

Panacea, Holsatica. A name formerly given to a more or less acidulous sulphate of potass, ob-

tained from the residuum of the distillation of nitric acid.

Patent Yellow. A fused chloride of lead, which is used as a pigment, and is of a beautiful lemon colour.

Pearl-Ash. The commercial name for an impure carbonate of potass, obtained by burning weeds. It may be used in the laboratory for common purposes, when great accuracy is not required. *See* POTASS, CARBONATES OF.

Pearl White. A name formerly given to the oxide of bismuth, obtained by diluting a solution of bismuth in nitric acid. *See* BISMUTH, OXIDE OF.

PERCHLORIDES. Compounds of substances with the largest proportion of chlorine with which they can combine.

PERNITRATES. Compounds of nitric acid with the peroxides of metals.

PEROXIDES. Compounds of substances with the largest portion of oxygen.

PER-SALTS. Salts containing the peroxide of a metal.

PETALITE. A Swedish mineral, from which lithia is extracted. It contains about 79 per cent. of silica.

Petre, or Saltpetre. *See* POTASS, NITRATE OF.

Petroleum. *See* NAPHTHA.

Pharmacolite, or *Arsenic Bloom.* An arsenical mineral, consisting of arsenic acid, lime, and water. It is found in Germany, and may be called native arseniate of lime.

Philosophical Wool. An old name for the white oxide of zinc, obtained by burning the metal.

Phlogisticated, or *containing Phlogiston.* Before oxygen was discovered, bodies that did not contain it, were called phlogisticated, from the Greek word *Phlox*, because they were supposed to contain the matter of flame or fire. Hence, the nitrous acid was called *phlogisticated acid of nitre*, which is synonymous to deoxygenated nitric acid, and metals, when converted into oxides, instead of being supposed to have gained anything, were thought to have lost *phlogiston*, and thus were called *dephlogisticated.* From the above examples it will appear, with regard to compound bodies, that whenever a substance is said to be *phlogisticated*, we in our present theory, may call it *deoxydated*, or *deoxygenated*, and vice versa. *See Phlogiston.*

Phlogisticated Alkalies. A name formerly given to hydrocyanated alkalies, or cyanides of the bases of alkalies. *See Alkalies, Phlogisticated.*

Phlogiston. A supposed inflammable principle, which, before the discovery of oxygen, was thought to be the sole cause of the combustibility of metals, &c., or rather, as it is now called, their affinity for oxygen. Hence, when a metal was burnt, and, according to our theory, combined with oxygen, it was supposed to have lost its *phlogiston*, its other component part, namely, its calx, being left behind; and in all cases where

oxygen is given out, *phlogiston* was supposed to be taken in. *See Phlogisticated.*

Phosphates; formerly called *Photocrates.*—A class of salts formed by the combination of alkalies, earths, &c. with phosphoric acid. They are fusible at a strong heat, but many of the earthy and metallic phosphates are insoluble in water. All the alkaline phosphates are decomposed by lime, but none of them can be decomposed by heating them with charcoal, except the phosphate of ammonia.

Phosphites. Combinations of phosphorous acid with alkalies, &c. They are of no consequence, but some of them are more soluble than the phosphates.

Phosphorana. Perchloride, or bichloride of phosphorus. *See* Phosphorus, Chlorides of.

Phosphorane. Protochloride of phosphorus.

Phosphorite. An opake mineral, of a yellowish white colour, which is phosphorescent by heat. It consists of phosphate of lime, fluoride of calcium, silica, and oxide of iron.

Phosphorus; formerly called *Phosphorus of Urine, Kunkel's Phosphorus, English Phosphorus.*—Phosphorus is a solid flesh-coloured substance, evidently transparent, and having the consistency of wax. It may be easily cut with a knife, or twisted asunder with the fingers, in which last case the precaution must be taken of frequently plunging it into cold water, to prevent its taking fire, which it does at a heat of about 100°.

When phosphorus is kept in contact with the air at common temperatures, it undergoes a slow combustion, at the same time emitting a white fume, which is luminous in the dark, may be absorbed by water, and is found to consist of phosphorous acid; but, if it be made to burn rapidly by heating it, the product of the combustion is phosphoric acid. *See* ACID, PHOSPHORIC.

Many different processes have been recommended for obtaining phosphorus, but having carefully made a number of experiments upon the subject, I have constantly found the following to succeed in producing the largest quantity. A quantity of bones are burnt in any convenient furnace until they are almost entirely converted into a white ash, having the form of the bones employed; they are then pulverized, and put into a stoneware vessel, when $\frac{2}{3}$ths of their weight of sulphuric acid, together with some water, is poured upon them. Considerable heat is excited, and the mixture must be left to digest for two or three days, after which more water is gradually added, and the whole is digested upon a slow fire for some time.

This mixture being filtered, the white mass is washed with water as long as any thing soluble remains in it, and all the filtered solutions being mixed, they are evaporated in a stoneware vessel to the consistency of honey. At this period a sufficient quantity of charcoal powder is to be added to convert the extract into a stiff black paste, which,

being dried to powder, and distilled in an earthenware retort by a strong red heat, yields the phosphorus.

Phosphorus, Baldwin's. A name given to nitrate of lime, which, when properly heated, becomes luminous in the dark.

Phosphorus, Bolognian. This name is given to a peculiar phosphorescent compound of sulphur and barytes, which is prepared from a native sulphate, commonly called *Bolognian stone,* in the following manner:—Such native sulphate of barytes is to be selected for the operation as is most heavy, friable, and exfoliated, when broken. It is made red-hot in a crucible, and reduced to a very fine powder in a stone or glass mortar. This powder is then formed into a paste with mucilage of gum tragacanth, and divided into cakes as thin as the back of a knife, which are first to be dried by a gentle heat, and afterwards calcined in an open fire among the coals. The phosphorescent body thus obtained, if exposed to light, shines upon being carried into a dark place, like an ignited coal.

Phosphorus, Canton's. A phosphorescent sulphuret of lime, obtained from gypsum, by calcining it in the same manner as the sulphate of barytes is calcined for the production of *Bolognian phosphorus,* or by calcining a mixture of sulphur and quick-lime, obtained from oyster-shells. Its properties resemble those of Bolognian phosphorus.

Phosphorus, Chlorides of. There are two

chlorides of phosphorus, which we shall describe as follows:—When phosphorus, in a state of vapour, is passed through heated bichloride of mercury, a liquid compound is formed, consisting of 20 parts of phosphorus, and 67 of chlorine. It is as clear as water, of the specific gravity of 1.45, and by exposure to air it becomes acidulous. Its discoverer, Sir H. Davy, has named it *phosphorane*, but it is now called protochloride of phosphorus.

But when phosphorus is introduced into chlorine gas it burns, and a white substance condenses on the sides of the vessel, which is found to be a compound of 20 phosphorus, and 134 chlorine, whence it is called perchloride of phosphorus. It is a solid white substance, very volatile at a temperature much below that of boiling water, fusible when submitted to heat and pressure, and on cooling, it crystallizes in transparent prisms.

Phosphorus, Liquid. A luminous liquid, formed by boiling phosphorus in oil. When the phosphorus is dissolved, the whole becomes luminous in the dark.

Phosphorus, Sulphuret of. A compound of phosphorus and sulphur, formed by melting the two substances together in a glass flask or test tube, taking care to prevent the access of fresh air. It is so combustible, that even the slightest friction sets it on fire.

Phosphurets. Compounds of phosphorus with alkalies, earths, or metals. When the earthy phosphurets are put into water they become lumi-

nous, and phosphuretted hydrogen gas is disengaged.

Photocrates. *See* PHOSPHATES.

PICROMEL. The characteristic principle of that animal fluid, commonly called *bile.*

PICROTOXIA. The poisonous alkaline principle of the *cocculus indicus.* It is white, crystallizable, soluble in water and alcohol, and it combines with acids to form soluble salts.

PITCH. A well known resinous substance, obtained from a species of fir, called *picea,* or *epicea.*

Pitchblend. A sulphuret of uranium, much resembling pitch. *See* URANIUM, ORES OF.

PITCHSTONE. A silicious mineral, having a resinous lustre, and consisting chiefly of silica, but also containing alumina, lime, oxide of iron, oxide of manganese, &c.

Plaister of Paris. A native sulphate of lime found near Paris, and used as a plaister. *See* LIME, SULPHATE OF.

Platina. A name which is sometimes indiscriminately given to the metal platinum and its ore; but it should always be reserved for the latter, which, besides platinum, usually contains gold, iron, lead, palladium, rhodium, iridium, and osmium. *See Note* 14.

PLATINUM; formerly called *White Gold.*—Platinum is a very malleable metal, having a specific gravity between 21 and 23. It is white, with a slight tinge of grey, nearly as hard as iron, and can be welded like that metal. Platinum cannot

be oxydated by heat, and it is so refractory in the fire, that none of our furnaces can bring it to perfect fusion.

To obtain the pure metal from the ore, boil it in chlorine until nothing more can be dissolved, and add hydrochlorate of ammonia to the clear solution, to precipitate the platinum. Heat this precipitate to redness, redissolve it in chlorine, and again act upon the solution by hydrochlorate of ammonia, when the precipitate obtained is to be heated white hot, and by a proper mechanical means it may be welded into one mass. Platinum is sometimes used for making crucibles and other chemical vessels, as it is not acted upon by any of the pure acids, or by heat and air; but the scarcity of the metal, which is nearly as dear as gold, prevents these vessels from being in such general use as they otherwise would be; platinum combines with sulphur, oxygen, chlorine, &c., and also with the metals, but none of its combinations are much used in the arts.

If the precipitate formed by adding hydrochlorate of ammonia to hydrochlorate of platinum be heated to redness for some time, the hydrochlorate of ammonia is driven off, and pure platinum in a spongy form remains. If a slender jet of hydrogen gas be driven upon it, it at first gets red-hot, and then inflames the hydrogen gas, and on this principle lamps for obtaining an instantaneous light are often constructed. They are commonly called *hydro-pneumatic lamps.* *See Note* 14.

PLATINUM, AMMONIO-HYDROCHLORATE OF; formerly called *Ammonio-Muriate of Platinum.*—This is a triple compound of ammonia, oxide of platinum, and hydrochloric acid; it is insoluble in water, and may be formed by mixing ammonia, or hydrochlorate of ammonia, with a solution of platinum. This triple compound of platinum is decomposed by exposure to a red heat, when hydrochlorate of ammonia flies off, and a grey spongy residuum, consisting of metallic platinum, remains, this residuum is commonly called spongy platinum.

Platinum Ammonio-Muriate of. *See* PLATINUM AMMONIO-HYDROCHLORATE OF.

PLATINUM, AMMONIURET OF; also called *Fulminating Platinum.*—A compound of ammonia, oxide of platinum, and water, obtained by boiling platinum precipitated by ammonia, in a solution of potass. It explodes if heated to 420°, at the same time being decomposed.

PLATINUM, CHLORIDE OF; formerly called *Dry Muriate of Platinum.*—If the hydrochlorate of platinum be evaporated to dryness, a chloride of the metal results, which is again converted into a hydrochlorate by solution in water. *See* PLATINUM, HYDROCHLORATE OF.

PLATINUM, HYDROCHLORATE OF; formerly called *Muriate of Platinum.*—When platinum is dissolved in chlorine, the solution contains oxide of platinum, combined with hydrochloric acid; it is

used as a test to discriminate between the salts of potass and soda, as with the former it gives a yellow precipitate, while with the latter it gives none.

If hydrochlorate of platinum be mixed with a quantity of ether, an etherial solution of the metal will float at the top, while liquid chlorine remains at the bottom of the vessel. When the hydrochlorate of platinum is evaporated to dryness, a chloride of platinum is obtained.

Platinum, Muriate of. *See* PLATINUM, HYDROCHLORATE OF.

PLATINUM, OXIDES OF. There are two oxides of platinum, the protoxide, which is black, and the peroxide, which is of a brownish yellow colour. They are at present of no use, and the proportions of their component parts is not ascertained with certainty.

PLATINUM, PEROXIDE OF. A compound of platinum with the largest portion of oxygen. *See* PLATINUM, OXIDES OF.

PLATINUM, PROTOXIDE OF. A compound of platinum with the smallest portion of oxygen. *See* PLATINUM, OXIDES OF.

Platinum, Spongy. A name given to pure platinum, when by a peculiar process it is obtained in a spongy form. *See* PLATINUM.

PLATINUM, SULPHURETS OF. There are three sulphurets of platinum, which contain the metal in different proportions. The first is formed by heating the finely-divided metal with sulphur; the

second by adding sulphuretted hydrogen to a solution of platinum, and the third by heating sulphur with ammonio-hydrochlorate of platinum.

Plumbago. A native supercarburet of iron. *See* IRON, CARBURETS OF.

POLLENIN. A vegetable principle lately extracted from that part of flowers called the *pollen*. It is yellow, and insoluble in water, alcohol, and ether.

POLYCHROITE. A name given to the colouring principle of saffron.

Pompholyx. An old name for the oxide of zinc.

Ponderous Epoxicrate. *See* BARYTES, ACETATE OF.

Ponderous Muria. When dry, chloride of barium—when in solution, hydrochlorate of barytes.

Ponderous Nitre. *See* BARYTES, NITRATE OF.

Ponderous Spar. A name given to a native sulphate of barytes.

Ponderous Stone. A name given to a native tungstate of lime, which has a great specific gravity.

POTASH. *See* POTASS.

As *potash* is a name given in commerce to an impure carbonate of the alkali, the term POTASS is preferred for the pure alkali, to distinguish it.

POTASS; formerly called *Kali, Spodium, and Vegetable Alkali.*—Potass is a very important alkali, consisting of a metal called potassium and oxygen. It is usually obtained in combination with

carbonic acid, by burning vegetables, elixiviating their ashes, and evaporating the lixivium to dryness, by which means an impure carbonate of potass is obtained. It is commonly called *pot-ash*, or when heated to redness *pearl-ash*. Potass in a sufficiently pure state for common purposes, may be procured from pearl-ashes by dissolving them in water, filtering the solution, and mixing it with a quantity of pure hydrated lime; when after being digested for some time, the clear liquid will be found to contain the potass, void of carbonic acid; it should be evaporated to dryness in silver vessels, and preserved in well stopped bottles, as it rapidly absorbs carbonic acid and water from the atmosphere.

Pure potass is a whitish brittle substance, having a remarkably acrid taste, and being so corrosive as to destroy animal substances in a very short time; hence it is used as a caustic. It has a specific gravity of 1.700, is soluble in half its weight of water, and its solution renders vegetable blues green, and changes the yellow colour of turmeric to brown; it also dissolves a small portion of silica in the humid way, and hence a very concentrated solution of potass should not be kept in glass bottles. Potass is much used in the analysis of minerals containing silica, for, if fused with them in a sufficient quantity, it renders their silica soluble in water, from which it may again be precipitated by the addition of an acid; it is also used in the manufacture of soap, in bleaching, glass-making,

&c., and it easily combines with sulphur, chlorine, and the acids, with which it forms peculiar salts, formerly called *spodic salts, or salts of spodium.*

POTASS, ACETATE OF; formerly called *Foliated Earth of Tartar, and Spodic Epoxicrate.* — A very deliquescent salt, easily obtained by dissolving carbonate of potass in distilled vinegar, and evaporating to dryness. It is used in medicine, and is often decomposed for the purpose of procuring strong acetic acid.

POTASS AND ANTIMONY, TARTRATE OF; formerly called *Tartarized Antimony, and Tartar Emetic.* — A compound of one proportional of potass, one of protoxide of antimony, and two of tartaric acid. *See* POTASS, TARTRATES OF.

POTASS, ARSENIATES OF; formerly called *Spodic Arsenicrate.* — A soluble and crystallizable compound of arsenic acid and potass may be obtained by heating nitre and white arsenic together, when the latter is converted into arsenic acid, and the former is decomposed. It is used in medicine, and is properly called binarseniate of potass.

A neutral compound may also be formed; it is soluble and deliquescent, but cannot be crystallized.

Potass, Arsenical: A compound of potass with arsenious acid, (*white arsenic*). It is now called arsenite of potass.

POTASS, ARSENITE OF; formerly called *Arsenical Potass.*—A soluble compound of arsenous

acid (*white arsenic*) and potass. It is obtained by boiling arsenous acid in a solution of the alkali.

Potass, Bicarbonate of; formerly called *Prepared Kali.*—A crystallizable compound of potass with twice as much carbonic acid as is contained in the carbonate. *See* Potass, Carbonates of.

Potass, Bisulphate of; formerly called *Sal Enixum, Arcanum Duplicatum, Sal Sapientiæ, Panacea Holsatica, and Nitrum Vitriolatum.*—A compound of potass with twice as much sulphuric acid as is contained in the sulphate. *See* Potass, Sulphates of.

Potass, Bitartrate of; formerly called *Cream of Tartar, and Crystals of Tartar.*—A compound of potass with twice as much tartaric acid as is contained in the tartrate. *See* Potass, Tartrates of.

Potass, Carbonates of; formerly called *Salt of Tartar, Oil of Tartar per deliquium, Aëriated Vegetable Alkali, Aëriated Kali, Spodic Aërocrate, Aëroxic Vegetable Alkali, Fixed Nitre, and Aëriated Tartar.*—The carbonate of potass is one of the most important compounds of the alkali; it is obtained in a pure state from *pearl-ash* by dissolving it in water, separating the other salts contained by evaporation and crystallization, and afterwards evaporating the filtered liquid to dryness, by which means the pure carbonate of potass is left in the form of a white deliquescent powder, which effer-

vesces with acids, is very soluble in water, and is fusible in the fire at a red heat.

Carbonate of potass is used in chemical analysis for precipitating earths and metals in the form of carbonates, and in the arts for glass-making, bleaching, &c. If it be fused with ½rd of its weight of silica, it loses its carbonic acid, and forms a white glass, which is soluble in water, and its solution is commonly called liquor silicum, or liquor of flints.

Besides the carbonate, there is also a bicarbonate of potass, which is crystallizable, and may be formed by passing carbonic acid gas through a solution of the carbonate; it is of no great consequence, but is often used in the formation of portable effervescing draughts.

Potass, Chlorate of; formerly called *Hyperoxymuriate of Potass, and Oxymuriate of Potass.*—A compound of potass and chloric acid, formed by passing pure chlorine gas through a pretty concentrated solution of common carbonate of potass, and allowing the salt to crystallize, when the first crystals obtained will consist of the salt in question.

In consequence of the slight affinity by which the chlorate of potass holds its large quantity of oxygen, it is decomposed by combustibles, being converted into a chloride of potassium, and this decomposition takes place without the aid of heat. Hence, if a mixture of sulphur or phosphorus with chlorate of potass be triturated in a mortar,

or touched with sulphuric acid, inflammation and a violent detonation instantly ensue, and on this principle it is that the oxygenated matches are made.

To prepare these matches, three parts of chlorate of potass separately pulverized are gently mixed with one part of flowers of sulphur. A small quantity of gum-water is added, and the composition is coloured red or blue with vermilion or indigo; the matches being previously tipped with sulphur, a small quantity of this composition is put on them by dipping them into it, and when dry, they will immediately take fire on being touched with concentrated sulphuric acid.

Potass, Chromate of. A yellow soluble compound of potass and chromic acid, sometimes used as an auxiliary test for the metals, as the metallic chromates are generally insoluble, and differ in colour according to the metal which they contain. Hence, lead forms a yellow precipitate, zinc yellow, silver a carmine colour, and mercury a vermilion-coloured precipitate.

Potass, Ferrocyanate of. *Potass Ferroprussiate of.* *See* Potassium, Ferrocyanide of.

Potass, Ferrohydrocyanate of; formerly called *a solution of triple Prussiate of Potass.*— This is a compound, formed by dissolving ferrocyanide of potassium, (*see* Potassium, Ferrocyanide of), in water; it is much used as a test for metal in solution, and when slowly evaporated,

crystals of a hydrated ferrocyanide of potassium are formed. *For a table of the precipitates which different metals give with this salt, see* FERROHYDROCYANATES.

POTASS, HYDROCHLORATE OF; formerly called *Solution of Muriate of Potass.*—This is a compound of hydrochloric acid and potass, which (like the compounds of other hydrogen acids) can only exist in solution; for, when dried, it is converted into a chloride of potassium. It is at present of no consequence in the arts, or in the laboratory. *See* POTASSIUM, CHLORIDE OF.

POTASS, HYDROCYANATE OF; formerly called *Solution of Prussian Alkali, Solution of Prussiate of Potass,* and when impure, *Lixivium of Blood.*—A compound of hydrocyanic acid and potass is with difficulty obtained free from iron, and when it contains that metal it is called a ferrohydrocyanate; the pure hydrocyanate becomes decomposed, if long kept, and it is sometimes used as a test for metals, (*see* HYDROCYANATES), but the ferrohydrocyanate is generally preferred for this purpose. The substances formerly known under the names of *solution of Prussian alkali, lixivium of blood, &c.*, sometimes contain iron, and sometimes not, according to the method of their preparation. Whenever potass or any other alkali is combined with hydrocyanic acid by boiling it with cyanide of iron (*Prussian blue*), a ferrohydrocyanate is formed; but if instead of cyanide iron, we use cyanide of mercury, a pure hydrocyanate is ob-

tained, which, by evaporation, yields a solid cyanide of the metallic base of the alkali.

Hydrocyanate of potass may be obtained in an impure state by calcining a mixture of blood, bones, or any other animal matter, with common carbonate of potass, (*pearl-ash*) and lixiviating the mixture; when thus prepared, it always contains some carbonate of potass, and sometimes a small quantity of iron, but it may nevertheless be used for the formation of cyanide of iron (*Prussian blue*).

Potass, Hyperoxymuriate of. *See* POTASS, CHLORATE OF.

POTASS, MANGANESITE OF; formerly called *Camelion Mineral.*—It has lately been discovered, that the dark greenish substance, commonly called *camelion mineral,* consists of potass, and a peculiar acid, formed by the combination of manganese with more oxygen than is contained in its oxides; and, if this manganesite of potass be dissolved in water, in a short time part of the acid combines with a second dose of oxygen, manganesate of potass is formed, the green colour is changed to red, and some deutoxide of manganese is precipitated. The following extract is taken from the Quarterly Journal of Science, Literature, and the Arts.

"The acid in the green camelion Dr. Forshammer has called manganeseous acid; that in the red, manganesic acid. The manganeseous acid is very easy of decomposition; when combined

with potass it forms a submanganesite, and whenever the potass is saturated, or its action weakened, the manganeseous acid is decomposed into deutoxide of manganese, and manganesic acid: hence, the changes of the camelion. A green solution exposed to the air turns red by the absorption of carbonic acid, which precipitates deutoxide of manganese. Acids have the same effect, and even water also in great quantity, by weakening the power of the alkali. When the red colour is changed to green, it is in consequence of the presence of some body absorbing oxygen, as alcohol, protoxide of manganese, &c., and Chevreul has shewn that even filtering through paper will have the same effect." Manganesite of potass (*camelion mineral*) may be formed by strongly igniting 3 parts of nitrate of potass, and 1 of peroxide of manganese, until the mixture ceases to boil, or give out oxygen gas.

Potass, Muriate of. *See* POTASSIUM, CHLORIDE OF.

POTASS, NITRATE OF; formerly called *Nitre, Saltpetre or Petre, and Spodic Nitre.*—Nitrate of potass is the best known, and most important of all the nitrates. It has a sharp cooling taste, is very brittle, has a specific gravity of 1.9, and is soluble in seven times its weight of cold water, or rather less than its weight of boiling water. When mixed with $\frac{1}{3}$rd of charcoal, and thrown into a red-hot crucible, detonation and decomposition ensue, and the salt is converted into a car-

bonate of potass, but, if it be exposed without addition to a red heat it fuses, gives out oxygen, and is converted into a nitrite. Nitrate of potass is used in large quantities in the arts, for making fire-works and gun-powder, as well as in the manufacture of the sulphuric and nitric acids. It often contains some common salt, from which it should always be freed before it is employed for making nitric acid, and this may be done by dissolving it in boiling water, and partly evaporating the solution, when the common salt, which falls down, may be separated by a filter, and the nitre will crystallize on cooling.

Potass, Prussiate of. *See* POTASS, HYDROCYANATE OF.

POTASS, SILICATED; when in solution, formerly called *Liquor Silicum, Liquor of Flints, and Silicious Potass.*—A soluble compound of silica and potass, formed by fusing four parts of carbonate of potass with one of powdered quartz. Its solution is used as a test for uncombined acids, with which it forms a gelatinous precipitate of hydrated silica.

POTASS, SULPHATE OF; formerly called *Sal Polychrest, Spodic Vitriol, and Vitriolated Kali.*—The sulphate of potass is a crystallizable salt, of limited solubility in water. Like all other sulphates it is converted into a sulphuret by heating it with charcoal, but it cannot be decomposed by any of the acids. It is used in medicine, and is usually prepared by saturating the bisulphate

(which remains in the retort after the distillation of nitric acid) with carbonate of potass. It has a lively penetrating taste, and crystallizes in hexahedral prisms.

POTASS, SULPHITE OF; formerly called *Spodic Sulphurocrate, Stahl's Sulphureous Salt, and Sulphureous Tartar.*—A compound of sulphurous acid and potass, formed by passing sulphurous acid gas into a solution of carbonate of potass. It is the best known sulphite, but has no very striking properties.

POTASS, SULPHURET OF; formerly called *Hepar Sulphuris, or Liver of Sulphur, Saline Hepar, Spodic Hepar, and Sal Hepar.*—A compound of sulphur and potass, usually formed by the direct union of its component parts. It is of a greyish colour, resembling liver, soluble in water, being at the same time converted into a hydrosulphuret, and when acted upon by diluted acids sulphur is precipitated, and sulphuretted hydrogen is disengaged. It is not much used in the arts, but is sometimes taken as a medicine.

POTASS, SUPEROXALATE OF; formerly called *Sal Acetosellæ, and Salt of Sorrel.*—Superoxalate, or binoxalate of potass, is a salt found ready formed in common wood-sorrel, from the juice of which it is obtained by evaporation and crystallization. It is much used under the name of *salt of lemons,* or *salt of sorrel,* for taking out ink stains.

POTASS, SUPERSULPHATE OF. *See* POTASS, BISULPHATE OF.

POTASS, SUPERTARTRATE OF. *See* POTASS, TARTRATES OF.

POTASS, TARTRATES OF. There are two compounds of potass and tartaric acid, namely, the bitartrate or supertartrate, and the neutral tartrate; the former is abundantly met with in commerce, and is sold under the name of cream of tartar. It is sparingly soluble in water, but may be crystallized by evaporation. The latter is formed for medicinal purposes by saturating the bitartrate with carbonate of potass; it is much more soluble in water, and its crystals are generally larger. Besides these, we also have a tartrate of potass and antimony, commonly called *tartar emetic*. It is prepared by boiling 9 drachms of protoxide of antimony, and 2½ ounces of powdered bitartrate of potass in 5 pints of water, until the powders are dissolved, filtering the solution, and evaporating it to a proper consistency, when, on cooling, crystals will be formed. It is better in this operation to use a fused oxide of antimony, as otherwise it might contain some deutoxide.

POTASSA. *See* POTASS.

POTASSIUM. A white metal, which fuses at 150°, has a specific gravity of about 0.805, and by its combination with oxygen in certain proportions forms the alkali called potass. It is perfectly opake, conducts electricity like other metals, and has a beautiful metallic lustre; but it is immediately covered with a coat of potass if exposed

to the air, and when a small quantity of it is thrown on water it floats and burns on its surface, decomposing it, and forming a solution of pure potass. Hence, it can only be preserved in a pure state by moistening it with naphtha, and keeping it in well stopped glass bottles. Potassium is malleable; at a heat a little below redness it rises in vapour, and if two bright pieces of it be pressed together they adhere as strongly as if they had always been one. It was first obtained by the action of voltaic electricity on pure potass, but an easier and more expeditious method is now adopted, by which all that is found in commerce is procured.

The middle part of a clean gun-barrel (open at both ends) is filled with iron-turnings, and the same part is covered outside with good fire-lute. It is now placed in a blast furnace, (somewhat in an inclined position) so that the luted part only may be exposed to heat, some pure potass is put into the upper end, (to which a safety-tube is luted) and the lower end is fitted to a copper-receiver, also connected with a safety-tube. The fire being now raised to whiteness, the potass will fuse by the heat which the gun-barrel conducts to it, or some burning charcoal may be applied; when it runs down, and comes in contact with the iron-turnings (which should be at a white heat) it will be decomposed, and potassium will be collected in the receiver beneath.

Potassium combines with oxygen in two defi-

nite proportions; it also unites with chlorine, iodine, cyanogen, fluorine, hydrogen, sulphur, the metals, &c.

POTASSIUM, CHLORIDE OF; formerly called *Dry Muriate of Potass, Febrifuge Salt of Sylvius, Regenerated Sea-Salt, and Salitated Tartar.*—An uninteresting compound of potassium and chlorine, formed by evaporating the hydrochlorate of potass to dryness. *See* ACIDS, HYDROGEN. It can only exist in a dry state, for when dissolved in water it becomes converted into a hydrochlorate of potass.

POTASSIUM, CYANIDE OF; formerly called *Dry Prussiate of Potass, Prussian Alkali, and Phlogisticated Alkali.*—A compound of cyanogen and potassium, which, when converted into a hydrocyanate of potass by solution in water, becomes very useful as a test for metals. *See* POTASS, HYDROCYANATE OF.

POTASSIUM, FERROCYANIDE OF; formerly called *Triple Prussiate of Potass.*—If cyanide of iron (*Prussian blue*), be boiled with pure potass, decomposition ensues, a red oxide of iron remains undissolved, and a solution is obtained, which consists of ferrohydrocyanate of potass. If this solution be slowly evaporated, on cooling, yellow cubic crystals of ferrocyanide of potassium are obtained; they are insoluble in alcohol, but very soluble in water. The ferrocyanide of potassium is sometimes called a *ferrocyanate of potass*, and when dissolved in water, it becomes con-

verted into a ferrohydrocyanate of potass. *See* POTASS, FERROHYDROCYANATE OF.

POTASSIUM, DEUTOXIDE OF. A compound of potassium with the second and largest portion of oxygen. *See* POTASSIUM, OXIDES OF.

POTASSIUM, OXIDES OF. There are two compounds of potassium with oxygen; namely, the peroxide or deutoxide, and the protoxide; the former is procured by burning the metal in oxygen gas, and the latter is commonly called potass. (*See* POTASS.) If the peroxide be thrown into water, oxygen gas is disengaged, and a solution of the protoxide (*potass*) results.

POTASSIUM, PEROXIDE OF. A compound of potassium with the largest portion of oxygen. It is sometimes called the deutoxide. *See* POTASSIUM, OXIDES OF.

POTASSIUM, PROTOXIDE OF. *See* POTASS, which is a compound of potassium with the smallest portion of oxygen with which it can combine.

Potential Cautery. A name formerly given to caustic potass, which is used by surgeons. *See* POTASS.

Powder of Algaroth. See Algaroth, Powder of.

Powder of Sympathy. An old name for sulphate of copper, which has been converted into a dry powder by exposure to air. *See* COPPER, SULPHATE OF.

Powder Blue. A pigment, prepared by fusing

oxide of cobalt with white glass, and grinding the whole to powder. It is chiefly used by laundresses.

Precipitate per se. A name given to the red peroxide of mercury. *See* MERCURY, OXIDES OF.

Precipitate, Purple, of Cassius. See GOLD, STANNATE OF.

Precipitate, Red. A name given to the red peroxide of mercury. *See* MERCURY, OXIDES OF.

Precipitate, White. See Mercury, White Precipitate of.

PRECIPITATES. All substances which have been thrown down from any solution in a pulverulent state are called precipitates, and the old chemists applied this term to almost all pulverulent metallic compounds.

Principle, Astringent. See ACID, GALLIC. The astringent principle and the gallic acid were for a long time confounded, but they have since been separated from each other, and found to be distinct substances, although generally existing in a combined state in vegetables. To distinguish the astringent principle from the gallic acid, it is now called *tannin*, or *tan. See* TANNIN.

PRINCIPLE, BITTER. This is a yellowish brown substance, obtained from vegetables; it is soluble in water and alcohol, has an intensely bitter taste, and is precipitated from its solutions by nitrate of silver.

Principle, Tanning. See TANNIN.

PRINCIPLES. Those bodies which have peculiar properties of their own, and form definite compounds with each other.

The principles are divided into two sorts, namely, *proximate* principles, and *ultimate* principles, or simple bodies. *See* BODIES, SIMPLE.

The proximate principles are rather numerous, they exist both in the vegetable and animal kingdoms, and cannot be decomposed without resolving them into simple bodies. Those existing in the vegetable kingdom are as follows:—sugar, sarcocol, mucilage, mucus, gelatine, ulmin, polycroite, hematin, chlorophyle, quassin, scillitin, caffein, nicotin, daphnin, asparagin, cerasin, inulin, fecula, indigo, gliadine, zimome, lignin or vegetable fibrin, camphor, bird-lime, resin, guiacum, caoutchouc, cerin or subercerin, medulla, fungin, bitter principle, extractive matter, tannin or tan, gum-resins, emetin, violine, the vegetable alkalies and acids, &c.

The proximate principles of animal substances are not so numerous as those obtained from the vegetable kingdom. The most interesting of them are:—gelatine, albumen, fibrin, the colouring matter of the blood, mucus, caseous matter, urea, picromel, osmazome, sugar of milk, cantharadin, cochenelin or carmina, stearine, elain, the animal acids, &c.

Although in the above list the animal and vegetable principles are separated, yet many of them

are not peculiar to animals or vegetables, as they may be obtained from both.

Proof Spirit. A mixture of alcohol with about an equal quantity of water. It is generally used for the formation of tinctures.

PROTOCHLORIDES. Compounds of substances with the smallest definite proportion of chlorine.

PROTONITRATES. Compounds of nitric acid with the protoxide of any metal.

PROTO-SALTS. Salts containing the protoxide of a metal.

PROTOSULPHATES. Compounds of sulphuric acid with the protoxide of any metal.

PROTOXIDES. Compounds of any substance with the smallest definite proportion of oxygen.

Prussiates. *See* HYDROCYANATES.

Before the composition of the hydrocyanic acid was discovered, it was called prussic acid, and hence its compounds were called prussiates, but, as it is found to be a compound of hydrogen, and a base called cyanogen, its salts are now called hydrocyanates.

Prussides. *See* CYANIDES.

Prussine. *See* CYANOGEN.

Pulvis Constantini. A name formerly given to a tartrate of mercury.

Pyrites, Cobalt. A name given to a native compound of cobalt, sulphur, and arsenic. *See* COBALT, ORES OF.

Pyrites, Copper. Pyrites, Cupreous. Names given to a native compound of iron, sulphur, and copper. It is properly called a bisulphuret of iron and copper. *See* COPPER, ORES OF.

Pyrites, Iron. Pyrites, Martial. Names given to a bisulphuret of iron, which is abundantly found in nature. *See* IRON, ORES OF.

Pyrophori. Those compounds which take fire spontaneously when exposed to air. There are several sorts of pyrophori, but we shall only mention two of them, which are the most curious, and the most easily obtained.

To obtain the most common pyrophorus, 1 part of alumn is mixed with 2 or 3 of sugar or flour; the mixture is put into an earthenware pan, and constantly stirred over the fire until it becomes a perfectly dry, black, and brittle mass. It is then pulverized, and introduced into a green glass phial standing in a crucible full of sand; the whole being placed in the middle of some burning coals, it is kept at a red heat as long as any smoke or flame issue from the mouth of the phial; after which the fire is allowed to go out, and the pyrophorus is protected from the air by a clay stopper. When thus obtained, it may be transferred into a clean dry bottle, and, if a small quantity of it be thrown on a piece of paper it takes fire almost immediately, in consequence, (as it is supposed) of a small quantity of potassium, which has been formed from the potass contained in the alumn. This appears probable, since damp air causes it to burn

more quickly than dry air, and it is well known that water induces the combustion of potassium.

The other sort of pyrophorus is of late discovery; it is obtained by heating tartrate of lead to redness in a glass phial or test-tube, and its action is supposed to be in consequence of the metallic lead, which it contains in a very minute state of division.

Q.

QUARTZ. A very abundant mineral, consisting almost entirely of silex. It is hard enough to scratch glass, and is often found in the form of six-sided prisms, when it is called rock-crystal. It occurs transparent, opake, and of almost all colours; the opake white variety is called milk-quartz. The following minerals are all species of quartz, amethyst, prase, cat's eye, flint, flinty slate, jasper, chalcedony, heliotrope, silicious sinter, pearl sinter, or fiorite, &c. &c.

In Somersetshire round stones are found, which from their resemblace to potatoes are called *potato-stones;* they are hollow, and, when broken, crystals of quartz appear inside them, sometimes accompanied by carbonate of lime.

QUASSIN. A yellowish brown vegetable principle, obtained from *quassia;* it has an intensely bitter taste, and is slightly transparent.

Quicklime. Lime freed from carbonic acid and water. *See* LIME.

Quicksilver. *See* MERCURY.

QUINIA. A vegetable alkali, obtained from the yellow Peruvian bark, and resembling cinconia in its properties.

R.

RADICALS. *See* PRINCIPLES.

Realgar. A name given to the red sulphuret of arsenic. *See* ARSENIC, SULPHURET OF.

Regulus of a Metal. A term formerly applied to metals in a pure state. Thus, pure tin was called regulus of tin, while its oxide was called calx of tin.

Residuum. What remains fixed in a retort, crucible, &c., after an operation has been performed.

RESINS. Resins are vegetable substances, for the most part insoluble in water, but soluble in alcohol, oils, acetic acid, &c. They may be melted without decomposition, and by distillation they afford volatile oil, but, if treated with nitric acid, they are converted into TANNIN.

RESINS, GUM. Gum resins are distinguished from common resins by infusibility. They are dissolved by alcohol, and if treated with nitric acid, they yield TANNIN.

RHODIUM. Rhodium is a white malleable metal, which is as hard as iron, and more infusible than any other metal except iridium. It is obtained in the following manner, from the solution of the ore of platinum, from which the platinum has been separated by hydrochlorate of ammonia. The clear liquor, after the precipitation of the pla-

tinum, is acted upon by a rod of zinc, when a black powder is precipitated; it is washed with diluted nitric acid, and dissolved in chlorine. Hydrochlorate of soda (*common salt*) is now added, and the whole is evaporated to dryness, and washed with alcohol until nothing more can be dissolved. A red substance remains, which, being dissolved in water, and again precipitated by zinc, gives a button of pure rhodium when intensely ignited with subborate of soda (*borax*).

Rhodium combines with all metals except mercury, has a specific gravity of 10.649, and is of no use in the arts, but has lately been applied to the formation of the nibs of pens. It forms three oxides, and unites with chlorine, iodine, &c.

Rhodium, Deutoxide of. A compound of rhodium with the second proportion of oxygen. *See* Rhodium, Oxides of.

Rhodium, Oxides of. There are three compounds of rhodium and oxygen, namely, the protoxide, which is black, the deutoxide, which contains twice as much oxygen, being of a dark brown colour, and the peroxide, which contains three times as much oxygen as the protoxide, and is red. Neither of these oxides are of any use, but the metal may be obtained from them by intensely igniting them with subborate of soda (*borax*).

Rhodium, Peroxide of. A compound of rhodium with the largest portion of oxygen. *See* Rhodium, Oxides of.

Rhodium, Protoxide of. A compound of

rhodium with the smallest portion of oxygen. *See* RHODIUM, OXIDES OF.

ROCK CORK. Rock or mountain-cork is a mineral substance, of a red or greenish white colour. It is opake and earthy, and, its specific gravity being always less than that of water, it floats upon that fluid. It consists of silica 56, carbonate of magnesia 26, alumina 2, carbonate of lime 13, and oxide of iron 3.

Rock, Crystal. A common name for pure crystallized quartz. *See* QUARTZ.

Rubellite. A red species of tourmalin, which owes its colour to the manganese which it contains.

Ruby. A red variety of corundum, or adamantine spar; it is very hard, and consists almost entirely of alumina.

Rust. A percarbonate of iron, which is formed when the metal is left for some time exposed to damp air. *See* IRON, CARBONATES OF.

Rutile. A name given to the native oxide of titanium. *See* TITANIUM, ORES OF.

S.

SACCHAROCRATES. *See* OXALATES.

Saccholates. *See* MUCATES.

Saffron, Martial. *See* IRON, PEROXIDE OF.

Sal Acetosellæ. *See* POTASS, SUPEROXALATE OF, which is obtained from *sorrel.*

Sal Ægypti. A name formerly given to an impure native carbonate of soda found in Egypt. *See* SODA, CARBONATE OF.

Sal Alembroth. A compound said to be formed by adding hydrochlorate of ammonia (*sal ammoniac*) to a solution of *corrosive sublimate*. It consists of ammonio-hydrochlorate of mercury.

Sal-Ammoniac. *See* AMMONIA, HYDROCHLORATE OF.

The name of *sal-ammoniac* is also given to all the salts of ammonia, at the same time distinguishing them by the name of their acid, or by one of their characteristic properties; thus, we have *acetous sal ammoniac, nitric sal ammoniac, flaming sal ammoniac, &c.*

Sal Ammoniac, Cupreous Flowers of. A name given to a sublimed hydrochlorate of ammonia containing copper.

Sal Ammoniac, Diuretic Spirit of. A name given to the solution of ammonia, obtained by distilling hydrochlorate of ammonia, quicklime, and water together. *See* AMMONIA.

Sal Ammoniac, Dulcified Spirit of. A solution of ammonia in alcohol.

Sal Ammoniac, Fixed. An absurd name, formerly given to the chloride of calcium, or hydrochlorate of lime, commonly called muriate of lime. No reason can be found for the adoption of this name, unless it be, that the residuum, after the distillation of lime and sal ammoniac, consists of it.

Sal Ammoniac, Fixed Vegetable. A name formerly given to the acetate of lime.

Sal Ammoniac, Flaming. A name given to the nitrate of ammonia, because when thrown upon burning coals it flames and is decomposed.

Sal Ammoniac, Glauber's. Sal Ammoniac, Glauber's, Secret. Names given to a sulphate of ammonia, first prepared by Glauber, and for some time kept secret.

Sal Ammoniac, Martial. A hydrochlorate of ammonia containing some iron.

Sal Ammoniac, Nitric. See AMMONIA, NITRATE OF.

Sal Ammoniac, Secret. Sulphate of ammonia.

Sal Ammoniac, Sublimate of. Sublimed hydrochlorate of ammonia.

Sal Ammoniac, Succinic. Succinate of ammonia.

Sal Ammoniac, Tartareous. A name given to a tartrate of potass and ammonia, which is obtained by saturating supertartrate of potass with carbonate of ammonia.

Sal Aquarum. Carbonate of soda obtained this name from its being abundantly found in many of the lakes of Egypt. It was also called natron, and by some the nitrum of Egypt.

Sal Catharticus Amarus. See MAGNESIA, SULPHATE OF.

Sal Cretæ Coralliorum. An old name for acetate of lime.

Sal de Duobus. Sulphate of potass.

Sal Diureticus. A name formerly given to the acetate of potass.

Sal Enixum. *See* POTASS, BISULPHATE OF.

Sal Gem. A name for common salt, which, when in a dry state, is, properly speaking, a *chloride of sodium.*

Sal Hepar. *See* POTASS, SULPHURET OF, which has the colour of liver.

Sal Martis. A name formerly given to the protosulphate of iron. *See* IRON, SULPHATES OF.

Sal Mirabile. *See* SODA, SULPHATE OF.

Sal Perlatum. *See* SODA, PHOSPHATE OF.

Sal Polychrestum. *See* POTASS, SULPHATE OF.

Sal Polychrestum de Seignette. A name given to a tartrate of potass and soda, commonly called *Rochelle salt.*

Sal Prunellæ. Nitrate of potass goes by this name when it is made up into little balls for medicinal purposes.

Sal Rochelle. A name given to a tartrate of potass and soda, obtained by saturating supertartrate of potass with carbonate of soda.

Sal Rupelleuse. *See Sal Rochelle,* which is a tartrate of potass and soda.

Sal Seignette. *See Sal Rochelle,* which is a tartrate of potass and soda.

Sal Vegetabile. *See* POTASS, BITARTRATE OF, which is a salt of vegetable origin.

Sal Volatile. *See* AMMONIA, CARBONATE OF.

Salmiac. *See* AMMONIA, HYDROCHLORATE OF.

Salt of the Alps. *See* MAGNESIA, SULPHATE OF. *See Alps, Salt of.*

Salt of Amber. *See* ACID, SUCCINIC.

Salt of Ammonia. *See* AMMONIA, CARBONATE OF.

Salt, Animo-Mineral. This name was given to a sebate of soda, because its alkali is of the mineral, and its acid of the animal kingdom.

Salt, Argillaceous, Marine. A name given to a hydrochlorate or muriate of alumina, because the hydrochloric acid was formerly called the marine acid.

Salt, Arsenical, Neutral. A binarseniate of potass.

Salt of Benzoin, or Benjamin. *See* ACID, BENZOIC.

Salt of Canal. A name given to SULPHATE OF MAGNESIA.

Salt, Cathartic. *See* MAGNESIA, SULPHATE OF, which is used as a cathartic in medicine.

Salt, Coagulated Spirit of. An absurd name for the hydrochlorate of potass, or chloride of potassium.

Salt of Colcothar. A name given to the protosulphate of iron, because the red pigment commonly called colcothar, is always obtained from it.

Salt, Common. Common salt, when dry, is a

chloride of sodium, but when in solution, it is a hydrochlorate of soda.

Salt, Digestive. A name given to the chloride of potassium, or *muriate of potass.*

Salt, Diuretic. Acetate of potass.

Salt of Egra. Sulphate of magnesia.

Salt of England. *See* AMMONIA, CARBONATE OF.

Salt, Epsom. *See* MAGNESIA, SULPHATE OF, which is found in large quantities in springs at Epsom.

Salt, Essential, of Tartar. *See* ACID, TARTARIC, which is obtained from *cream of tartar.*

Salt, Febrifuge, of Sylvius. An old name for the hydrochlorate of potass, or chloride of potassium, commonly called muriate of potass. *See* POTASSIUM, CHLORIDE OF.

Salt, Fusible, of Urine. A name given to a phosphate of soda and ammonia, which is contained in urine.

Salt, Glauber's. *See* SODA, SULPHATE OF, which was first prepared from the residuum of the distillation of hydrochloric (*muriatic*) acid by Glauber.

Salt, Green. A name given by miners to the upper stratum of common salt found in the mines. It is always very impure.

Salt of Hartshorn. *See* AMMONIA, CARBONATE OF.

Salt of Kali. *See* POTASS, CARBONATES OF.

Salt of Lead. *See* LEAD, ACETATE OF.

Salt, Lixiviate. *See* POTASS, CARBONATES OF.

Salt, Magnesian. A name formerly given to a chloride of magnesium, or (when in solution) a hydrochlorate of magnesia. It is commonly called *muriate of magnesia.*

Salt, Marine. *When dry,* CHLORIDE OF SODIUM. *When in solution,* HYDROCHLORATE OF SODA.

Salt, Mycrocosmic. Phosphate of soda and ammonia.

Salt, Oil of. An old name for the hydrochloric or muriatic acid, which being obtained from common salt by distillation, was looked upon as the essential oil of that substance.

Salt, Phosphoric. Phosphate of soda and ammonia.

Salt, Ponderous, Marine. *When in solution,* HYDROCHLORATE OF BARYTES. *When dry,* CHLORIDE OF BARIUM. This substance was called ponderous marine salt, because it is very heavy.

Salt, Regenerated Marine. A name given to the chloride of potassium, or hydrochlorate of potass, because it resembles common sea-salt, and is composed of the same acid.

Salt, Rock. *See* SODIUM, CHLORIDE OF, which is called rock-salt when found native.

Salt, Sedative. *See* ACID, BORACIC.

Salt of Seidlitz. *See* MAGNESIA, SULPHATE OF.

Salt of Soda. This name is given to the bicarbonate of soda. *See* SODA, CARBONATES OF.

Salt, Spirit of. *See* ACID, HYDROCHLORIC, which is obtained from common salt by distilling it with sulphuric acid.

Salt of Steel. A name given to the protosulphate or green sulphate of iron. *See* IRON, SULPHATES OF.

Salt, Sulphurous, of Stahl. *See* POTASS, SULPHITE OF.

Salt of Tachenius. *See* POTASS, SULPHATE OF.

Salt of Tartar. *See* POTASS, CARBONATES OF.

Salt, Vegetable. A name given to the supertartrate or bitartrate of potass, because both its acid and its alkali are of vegetable origin.

Salt, Vegeto-Mineral. A name given to the acetate of lead, because it is a compound of a vegetable acid, with a mineral substance, namely, oxide of lead.

Salt of Vitriol. A name given to pure sulphate of zinc.

Salt, Volatile, of Hartshorn. *See* AMMONIA, CARBONATE OF.

Salt, Volatile, of Narcotic Vitriol. Salt, Volatile, of Vitriol. *See* ACID, BORACIC. Boracic acid being volatile when combined with water, and being precipitated from subborate of soda by *oil of vitriol* (sulphuric acid), it obtained this name, as some of the old chemists supposed it to exist in the sulphuric acid, and not in the *borax*, which is used in its preparation.

Salt of Wood-Sorrel. *See* POTASS, SUPEROXALATE OF, which is obtained in large quantities from *sorrel.*

Salt of Wormwood. *See* POTASS, CARBONATES OF. The simple carbonate of potass is called *salt of wormwood.*

SALTS; formerly called *Neutral Salts.*—The salts are a most important and numerous class of bodies, consisting of an alkali, earth, or other metallic oxide, combined with an acid; they are some of them found native, and they all possess one or more of the following properties, viz.: solubility, crystallizability, translucency, taste, and a specific gravity greater than that of water.

There are also different sorts of salts, namely, *sub-salts,* which contain an excess of their alkaline base; *super* or *bi-salts,* which contain an excess of acid; *proto-salts,* which contain a metallic oxide in the least degree of oxydation; and *per-salts,* containing it in the highest degree of oxydation. *For a table of the solubility, &c. of salts, see Notes 7 and 12, at the end of this volume.*

Salts, Acid. The old chemists used to apply this appellation to those substances which are now called pure acids, as the sulphuric and nitric acids; and the term is now sometimes used, but only to signify those combinations of an alkali and an acid, which contain an excess of the latter; thus, the bitartrate of potass is sometimes called an acid salt.

Salts, Alkaline. A name formerly given to

those substances now called alkalies; it was also applied to their carbonates.

SALTS, AMMONIACAL. Compounds of the alkali called ammonia, and an acid. *See* AMMONIA, CARBONATE OF, &c.

SALTS, CALCAREOUS. Salts having lime for their base. *See* LIME, CARBONATE OF, &c.

Salts, Essential. Saline substances, obtained from the juices of vegetables.

Salts, Jovial. Salts of Jupiter. Compounds of acids with oxide of tin. *See* TIN, &c.

Salts, Lunar. Salts of silver. *See* SILVER, &c.

Salts, Martial. Salts of iron. *See* IRON, &c.

Salts, Natrous. A name formerly given to the salts of soda when the alkali itself was called natron. *See Natron. See* SODA, &c.

SALTS, NEUTRAL. When acids and alkalies were called acid and alkaline salts, compounds of the two were always called neutral salts, but now this name is only applied when the acid and alkali exist in the exact proportions necessary for mutual saturation. Thus, the tartrate of potass is a *neutral salt*, but the bitartrate is an *acid salt.*

Salts, Ponderous. The salts of barytes were formerly distinguished by this name, in consequence of their great specific gravity. *See* BARYTES, &c.

Salts, Prussian. When dry, CYANIDES; *but when in solution,* HYDROCYANATES.

Salts, Saturnine. A name given to the salts of lead, which was called *Saturn.* *See* LEAD, &c.

Salts, Solar. A name formerly given to the salts of gold, when the metal itself was called the *Sun.* *See* GOLD, &c.

Salts, Spodic. When potass was called *spodium,* its combinations with acids were called *spodic salts.* *See* POTASS, &c.

Salts, Venereal, or of Venus. When copper was called *Venus;* its salts were called by the above name. *See* COPPER, &c.

SAND. A well known mineral substance, which is generally silicious. It is used in chemistry for protecting glass vessels from the immediate action of the fire by keeping them immersed in it, and heating the vessel containing the sand, which vessel is commonly called a *sand-pot.*

Sandiver. A commercial name for a sort of glassy scoria, which rises to the surface in the manufacture of glass; it was formerly much used as a flux.

SANDSTONE. A siliceous mineral, of no great interest. It usually contains iron, and is easily reduced to powder.

Sapphire. A variety of corundum. *See* CORUNDUM.

SARCOCOL. A newly discovered vegetable principle, having a bitter taste, and being soluble in water and alcohol. By the action of nitric acid it is converted into oxalic acid.

SASSOLINE. A mineral, consisting of boracic

acid, sulphate of magnesia and sulphate of iron. It is found near Sasso, in the territory of Florence.

Saturn. A name formerly given to LEAD. *See* METALS.

Schellium. An ore of tungsten, which was called by this name in honour of Scheele, who discovered the metal. *See* TUNGSTEN, ORES OF.

SCILLITIN. A white and transparent substance, extracted from squills.

SEBATES. *Saline* compounds of the sebacic acid.

SELENIATES. Compounds of the selenic acid with alkalies, &c. &c. They are generally deliquescent, of a vermilion colour, and, if a plate of zinc be immersed into their solutions, decomposition takes place, and metallic selenium is precipitated.

Selenite. A name given to sulphate of lime. *See* LIME, SULPHATE OF.

Selenite, Tartareous. A name given to an insoluble tartrate of lime.

Selenites. Formerly all the salts of lime were called *selenites*, and thus we have *tartareous selenite* for tartrate of lime, *saccharine selenite* for oxalate of lime, &c. but when the word *selenite* alone is made use of, it always signifies the sulphate.

SELENIUM. This is a substance of late discovery, having a metallic lustre, and hence being classed among the metals, although some have

thought more proper to place it with sulphur and phosphorus. It is slightly transparent, softens and melts at a heat a little above that of boiling water, and is volatilized at about 600°. It unites with oxygen, forming the selenic acid, but as it is a metal of rare occurrence, very little is known of its properties.

Semi-metals. A name formerly given to those metals which are brittle, such as bismuth, antimony, arsenic, &c.

SERPENTINE. Serpentine is a common mineral, generally of a dark-green colour, sometimes spotted, and being susceptible of a fine polish. It occurs amphorus and massive, and besides magnesia, it contains silica, iron, carbonate of lime, oxide of manganese, alumina, and water. That variety usually called pecious serpentine is very silicious.

SERUM. An animal fluid contained in blood and milk. Blood generally contains $\frac{4}{5}$ths of its weight of serum.

Siderite. A name given to a phosphuret of iron, (obtained from certain phosphoric ores) in consequence of Bergman supposing it to be a peculiar metal.

SILEX. *See* SILICA.

SILICA; formerly called *Silicious Earth, Earth of Flints, Silicite, and Pure Flint.*—Silica or silex is one of the most abundant and useful earths. It is inodorous and insoluble in every acid except the hydrofluoric, by which it is decomposed, forming

pounds; it is by some considered as an acid, and its compounds with alkalies, &c. are called silicates. Hence, we have silicated potass, silicated soda, &c.

Silicite. An old name for silex or silica. *See* SILICA.

SILICIUM. *See* SILICUM.

SILICON. *See* SILICUM.

SILICUM. The metallic base of silica, of which very little is known; it unites with fluorine, forming the fluosilicic acid, and it has a great affinity for oxygen. It is of a blackish colour, has a slight metallic lustre, resembling that of plumbago, and is sometimes classed with boron, under the name of *Silicon.*

SILICUM, OXIDE OF. *See* SILICA, which is a compound of silicum and oxygen.

SILVER; formerly called *Diana, and the Moon.* —Silver is a well known malleable metal, having a specific gravity of 10.474, and being distinguished from most others by its beautiful whiteness. It is commonly called a noble metal, as it is not oxydated by the air, or by the heat of a furnace; but it may be burnt by passing a powerful electric or galvanic shock through a small wire of it, when it gives out a beautiful light-green flame, and combines with oxygen, forming the oxide of silver. In consequence of the indestructibility of this metal by fire, it may be freed from all metals, except gold and platinum, by cupellation, (*see Note* 3, *at the end of this volume*), but, as we often want it in

a perfectly pure state, it is usually purified in the laboratory by the following process.

The impure silver is digested in a sufficient quantity of diluted nitric acid until nothing but a black powder remains, which consists of the gold and platinum, if it contain any; it is separated by a filter, and the liquor being diluted with distilled water, *a solution of common salt* (hydrochlorate of soda) is poured into it as long as it affords a white precipitate. This precipitate, when washed and dried, is a pure chloride of silver; it is easily reduced to the metallic state by mixing it with an equal weight of carbonate of potass, and exposing it to a strong red heat, when a button of pure silver will result. Silver easily combines with sulphur, and hence the reason why it tarnishes when exposed to sulphureous vapours. It is dissolved by the nitric acid, or in boiling sulphuric acid, but the metal may be precipitated from these solutions by copper and mercury, when it usually takes an arborescent form, and is commonly called *arbor Dianæ*.

Silver is used in the formation of several pieces of chemical apparatus, such as *crucibles*, for the fusion of minerals with alkalies; *evaporators*, for obtaining pure potass and soda; and *alembics*, for the distillation of pure hydrofluoric acid; but, in using all these, we must take care not to raise the heat above a moderate redness, as silver itself fuses at a strong red heat.

Silver combines with oxygen in one proportion,

fluosilicic acid; it has a specific gravity of 2.65, and, although infusible alone, if mixed with fixed alkalies, it runs into glass at a strong red heat; it may also be combined with potass or soda in different proportions, and, if three parts of the alkali be used to one of the earth, the compound resulting from their union will be soluble in water, as if the alkali were really combined with an acid. (*See* POTASS, SILICATED.) Silica is abundantly found in nature in the form of quartz, which consist almost entirely of it; it is used in the manufacture of earthenware, and forms the chief ingredient in glass, and all sorts of glass pastes, for imitating precious stones; it is a compound of silicum and oxygen, and, as it unites with alkalies, it is by some considered as an acid.

There are at present five different sorts of glass in common use, and these are all formed nearly by the same process, but differ much in the substances which they contain. The mixture which is to form the glass is reduced to powder, and calcined for some time in a proper furnace, when it is called the *fritt;* it is then fused in crucibles, placed in a round reverberatory furnace, capable of holding several of them, after which the *glass-gall* or *sandiver*, which consists of the unvitrifiable substances, is found floating on the top of the fused matter; it is skimmed off, and the glass is made use of for the manufacture of bottles, mirrors, &c.

The vessels, when formed, are carried to a heated

furnace, resembling an oven, and commonly called the *annealing furnace*, and here they remain for about twelve hours, at the end of which time they are allowed to cool gradually. This gradual cooling prevents the glass from being so brittle as it otherwise would be.

Bottle Glass, or Common Green Glass, is formed of soapboiler's waste (which consists of lime, with a little soda) and river-sand; or of sand, clay, lime, and sea-salt. The proportions differ according to the quality of the ingredients.

Broad Glass consists of soapboiler's waste 2 parts, kelp 1, and sand 1.

Crown Glass is formed by calcining and fusing 200 parts of fine silicious sand with 330 of good kelp.

Plate Glass consists of pure silicious sand 43 parts, nitrate of potass 1, carbonate of soda 26, quick-lime 4, and a variable quantity of old broken plate-glass.

Flint-Glass, which is generally used in the formation of drinking-glasses, &c., consists of silicious sand or ground flints 100 parts, oxide of lead 60, and good pearl-ash 30, to which is added a small quantity of oxide of manganese or nitre, to prevent the green colour which the glass would otherwise have in consequence of the combustible matter contained in it. *For the manner of forming different glass pastes in imitation of precious stones and enamels, see Note* 17, *at the end of the volume.*

Silicates. As the earth commonly called silica unites with alkalies, forming soluble com-

and it also unites with chlorine, iodine, the metals, &c. As it is found in commerce, it always contains copper, and in this state it is used for making several domestic utensils.

Silver, Aëriated Calx of. *See* SILVER, CARBONATE OF.

SILVER, AMALGAM OF. A compound of silver and mercury, which is softer or harder according to the proportions of the two metals. It is found native, and thus forms one of the ores of silver.

Silver, Calx of. *See* SILVER, OXIDE OF.

SILVER, CARBONATE OF; formerly called *Aëriated Calx of Silver.*—An insoluble compound of carbonic acid, and oxide of silver; it occurs native, as well as in chemical analysis, and when pure, it contains about 78 per cent. of the metal, the rest being carbonic acid and oxygen.

Carbonate of silver may be reduced to the metallic state by heat alone.

SILVER, CHLORIDE OF; formerly called *Muriate of Silver, Horn Silver, and Horn Moon.*—This is an insoluble compound of silver and chlorine, which is found native, when it is called *corneous silver ore;* it is usually white and pulverulent, and, being perfectly insoluble in water, it is obtained by pouring the hydrochloric acid, or its combinations, into any of the solutions of silver. It often occurs in chemical analysis, when the quantity of metal contained may be estimated by proportionals, or the whole may be reduced to the metallic state by fusing it with twice its weight of carbonate of potass.

Pure chloride of silver contains about 75 of the metal, and 25 of chlorine; it is of no use in the arts or in the laboratory, and it becomes black by exposure to light.

Silver, Crystals of. A name given to the nitrate of silver, because it is the most crystallizable salt of this metal.

Silver, Corneous Ore of. *See* SILVER, CHLORIDE OF, which resembles horn, and is found native.

Silver, Fulminating. There are two compounds of silver which have strong fulminating properties; the first and most dangerous consists of oxide of silver combined with ammonia; it is sometimes called ammoniuret of silver, and is prepared in the following manner. A solution of pure nitrate of silver is decomposed by lime-water, and the clear liquid is separated from the precipitate formed (oxide of silver) by decantation, or filtration; this precipitate is then digested for some time with strong liquid ammonia, when it becomes black, and acquires its dangerous properties; the supernatant fluid is poured off, and the compound thus obtained can no longer be touched with safety, as it even explodes by the slightest motion, or by the falling of a drop of water upon it.

The second fulminating silver is by some considered as an oxalate, and by others as a compound of oxide of silver, with an acid, called the *fulminic acid;* it is procured by dissolving silver

in a small quantity of nitric acid, boiling the solution for three minutes with an equal bulk of alcohol, and then allowing it to cool, when a crystalline powder will fall; it must be washed with water, and dried upon blotting-paper without the assistance of heat; at the same time great care must be taken not to let it undergo any friction, as it would infallibly explode.

Silver Glance. An ore of silver. *See* SILVER, ORES OF.

Silver, Horn. See SILVER, CHLORIDE OF, which sometimes resembles horn.

Silver, Muriate of. When the composition of the hydrochloric or muriatic acid was unknown, and the chloride of silver was supposed to be a real compound of the acid with the oxide of silver, it was called by this name; but, since the hydrochloric (*muriatic*) acid has been found to consist of chlorine and hydrogen, the compound in question is found to be a combination of chlorine with silver, and hence it is called chloride of silver. *See* SILVER, CHLORIDE OF.

SILVER, NITRATE OF; formerly called *Lunar Nitre, Lunar Crystals, or Crystals of Silver*, and when fused, *Lunar Caustic, and Lapis Infernalis.*—This is one of the most soluble and crystallizable salts of silver. It is formed by digesting the metal in nitric acid, diluted with three parts of water, when nitric oxide is disengaged, and the silver is dissolved. The solution thus obtained may be crystallized, or, if evaporated to dryness and

fused, it may be cast into the form of small cylinders, which are used in surgery.

As nitrate of silver blackens by exposure to light, (part of the metal being reduced) it is much used as an indelible marking-ink, to form which it need only be dissolved in water, with a little gum-arabic; the solution of this salt is also used as a test and precipitant for chlorine or hydrochloric acid; for, whenever it meets with these substances, an insoluble chloride falls, by which the quantity contained may be estimated. *See* SILVER, CHLORIDE OF.

Sulphur, phosphorus, hydrogen, and carbon, all reduce the nitrate of silver to the metallic state, and some of them without the intervention of heat; the two first, if mixed with a small quantity of the salt, and struck upon an anvil, produce a detonation, and if a piece of silk moistened with the solution be exposed to a current of pure hydrogen gas, it becomes coated with metallic silver. A stick of phosphorus immersed in a solution of nitrate of silver soon becomes incrusted with the metal in an arborescent form.

Fused nitrate of silver is much used by surgeons as a caustic, but, when it is prepared for this purpose, great care must be taken that it contain no copper, as that metal would be poisonous to wounds.

The nitrate of silver may be reduced to the metallic state by heat alone.

SILVER, ORES OF. Silver occurs almost in a

pure state, and its ores are very numerous; they are chiefly found in Peru and Mexico, and they contain the metal combined with one or more of the following substances, namely, silica, alumina, iron, arsenic, copper, mercury, antimony, lead, bismuth, sulphur, and chlorine; silver is also found in the states of a carbonate and a sulphate.

Horn Silver, or native chloride of silver, has a waxy lustre, is translucent, and often contains alumina, sulphuric acid, and oxide of iron; it is found in a number of different places, generally massive, but sometimes crystallized in cubes, and its colour is usually a dirty white. The chemical properties of chloride of silver may be found under the head, SILVER, CHLORIDE OF.

Native Carbonate of Silver often contains oxide of antimony and a little copper; its colour is dark grey; it has a slight metallic lustre, and is rather soft and brittle.

Bismuthic Silver, or bismuthic sulphuret of silver, is generally found dissimulated; it is a rare mineral, has a light-grey colour, and it consists of bismuth, silver, and sulphur, with a small quantity of iron and copper.

White Silver much resembles bismuthic silver in appearance, and it consists of lead, silver, antimony, iron, sulphur, alumina, and silica; it has a metallic lustre, and its specific gravity is about 5.3.

Black Silver has a metallic lustre, and is supposed to be an argentiferous sulphuret of copper.

Vitreous Silver Ore, or native sulphuret of silver is malleable, and may be cut with a knife; it has a metallic lustre, is of a lead-grey colour, and is found massive and crystallized in various forms. It consists entirely of silver and sulphur, and it is generally found in veins, with other silver ores.

Brittle Silver Glance, or brittle sulphuret of silver, much resembles the vitreous silver ore in appearance, but, besides silver and sulphur, it contains antimony, iron, copper, arsenic, and earthy impurities.

Red Silver Ore, or red antimonial sulphuret of silver, is of a beautiful red colour; it occurs massive and crystallized, it is brittle, and may be easily cut with a knife.

Antimonial Silver, or native alloy of antimony and silver, is found in Spain; it has a metallic lustre, and is of a yellowish colour; when it contains arsenic and iron it is called *arsenical antimonial silver.*

Native Amalgam of Silver is found in the form of crystals; it is easily decomposed by exposure to heat, which volatilizes the mercury, and leaves the silver.

Native Silver is found crystallized and massive; it is not quite so malleable as pure silver, and it usually contains gold, copper, arsenic, or iron. Native silver is often tarnished, and some specimens of it contain as much as 28 per cent. of gold.

The ores of silver (except the chloride) are easily

distinguished from those of other metals by digesting them in nitric acid, and mixing the solution with hydrochlorate of soda, (*solution of common salt*) when, if the ore contain silver, a white precipitate will be formed, which, on exposure to light, will become black.

For an example of the analysis of silver ores, see Note 8, at the end of the volume.

SILVER, OXIDES OF; formerly called *Calx of Silver.*—We know but one oxide of silver, which is of an olive-colour; it is usually obtained from the nitrate by means of potass, and, if it be exposed to a heat strong enough to melt silver, it is reduced to the metallic state; it is sparingly soluble in liquid ammonia, but insoluble in water; it is sometimes found native, and, if pure, it consists of about 93 silver, and 7 oxygen.

SILVER, SULPHATE OF; formerly called *Lunar Vitriol, and Vitriolated Silver.*—This is a compound of oxide of silver and sulphuric acid, which is sparingly soluble in water. It may be formed by double decomposition, or by boiling silver in concentrated sulphuric acid; it is recommended by some as a test for chlorine, &c., but the nitrate is a better test, and is more easily procured.

The sulphate of silver is of no use in the arts, and it is seldom used in the laboratory.

Silver, Vitriolated. See SILVER, SULPHATE OF.

SLATE. A well known mineral, consisting chiefly of silica and alumina.

Smalt. A blue pigment, consisting of glass blued by oxide of cobalt; for its preparation, *see* COBALT, OXIDES OF.

SOAP-ROCK. *See* STEATITE.

SODA; formerly called *Mineral Alkali, Marine Alkali, Fossil Alkali, Natron, and Fosalkali.*— Soda is a most important alkaline compound of a metal called sodium and oxygen; it much resembles potass in its properties and appearance, but may be distinguished from it by its compounds, which are generally more soluble than those of potass. Soda is of a greyish-white colour, has a specific gravity of 1.336, and in its taste and action upon animal substances it exactly resembles potass; it is very soluble in water, and like potass it becomes carbonated by exposure to the air, but it never becomes liquid, because the carbonate of soda is not deliquescent. Soda is obtained from sea-weeds in the same manner as potass is from those which grow entirely on dry land; it is always found in commerce in the state of a carbonate, containing, among many other impurities, a quantity of common sea-salt, when it is usually called kelp or barilla. It is generally used in the arts in preference to potass, as it makes better soap, and its causticity is not so great; it is also used as a flux in the manufacture of glass, as well as in chemical experiments upon mineral substances.

The properties of soda which have not been

mentioned, agree exactly with those of potass, and, as it is prepared in the same manner by substituting barilla for pearl-ash, the reader is advised to compare the present article with that on potass.

Soda, Acetate of; formerly called *Natrous Epoxicrate.*—A very soluble and crystallizable compound of acetic acid and soda. It is used in medicine, and in the laboratory for the preparation of acetic acid; it differs from the acetate of potass in not being deliquescent, but it is not much used in the arts.

Soda and Ammonia, Phosphate of; formerly called *Mycrocosmic Salt, and Crystallizable Salt of Urine.*—This salt is partially decomposed by heat, which separates its ammonia. It is sometimes used as a flux in assays with the blowpipe, and it is obtained from human urine by evaporation and crystallization.

Soda, Bicarbonate of. A compound of soda with two proportionals of carbonic acid. *See* Soda, Carbonates of.

Soda, Borate of. This is a salt of no importance, but there is another compound of boracic acid and soda, commonly called *borax;* it contains less acid than is necessary to saturate its base, and hence it is called Subborate of Soda.

Soda, Carbonates of; formerly called *Prepared Soda, Aëriated Mineral Alkali, Salt of Soda, Natrous Aërocrate, and Natron or Nitrum.*

—There are two compounds of soda and carbonic acid, which have been called subcarbonate and carbonate of soda, but, as the former contains enough carbonic acid to constitute a carbonate, the later containing just twice that quantity, they are now called carbonate and bicarbonate of soda.

The simple carbonate is found ready formed in kelp and barilla, from which it is separated by solution and crystallization, as also in the substance commonly called *salt of Egypt*, which is an impure native carbonate. Carbonate of soda is not deliquescent, it is crystallizable, and, if carbonic acid gas be passed through a solution of it, a quantity of the gas is absorbed, and a bicarbonate results.

Both these salts are used in medicine; they are useful in the laboratory for the decomposition of certain substances, and the simple carbonate is much used in the arts.

Soda, Hydrochlorate of. A compound of hydrochloric or muriatic acid with soda. It is formed by dissolving common sea-salt (chloride of sodium) in water. *See* Sodium, Chloride of.

Soda, Muriate of. When in a dry state this compound consists of chlorine and sodium, but, when dissolved in water, it forms a real compound of muriatic or hydrochloric acid, according to the rule given in the article Acids, Hydrogen. *See* Sodium, Chloride of.

Soda, Nitrate of; formerly called *Cubic or Rhombic Nitre, and Natrous Nitre.*—This is a crystallizable salt, obtained by double decomposi-

tion, or by saturating carbonate of soda with nitric acid. It is rather more bitter than the nitrate of potass, more soluble in cold water, but much less soluble in hot water. It is of no great use in the arts, but sometimes enters into the composition of fire-works, to which it is peculiarly adapted, as it does not burn nearly so fast as the common nitre or nitrate of potass.

Soda, Phosphate of. Phosphate of soda is a soluble and crystallizable salt, used in medicine as an aperient; it may be obtained by adding carbonate of soda to a solution of phosphoric acid, and crystallizing it by evaporation. A solution of this salt is used in chemical analysis for precipitating magnesia. *See Note* 16, *at the end of this volume.*

Soda, Subborate of; formerly called *Borax and Natrous Borax.*—This useful salt was formerly brought to Europe from the east in a very impure state, but, in consequence of the discovery of free boracic acid in considerable quantities in lakes of hot mineral water in Tuscany, several large manufactories of *borax* have been established on the continent, where it is made by boiling together 500 parts of water, 600 of carbonate of soda, and 500 of the boracic acid, obtained by the evaporation of the waters of Tuscany; the acid is added very gradually, as otherwise the effervescence which takes place would cause a loss of part of the materials, and when the boiling is finished, the clear solution is drawn off into proper

vessels for crystallization. The salt thus obtained is much used in the arts, as well as in medicine; it is a useful flux for earthy minerals, and it also forms a component part of enamels and glass pastes, and is often used in soldering metals.

SODA, SUBCARBONATE OF. *See* SODA, CARBONATES OF.

SODA, SULPHATE OF; formerly called *Glauber's Salt, Sal Mirabile, and Natrous Vitriol.*—This is a very soluble and crystallizable salt, easily obtained from the residuum of the distillation of hydrochloric (*muriatic*) acid by evaporation and crystallization. It is much used in medicine as an aperient, but it is not of much use in the laboratory; it possesses, however, one curious property, which we shall describe. If boiling water be nearly saturated with sulphate of soda, and the solution, while still hot, be put into a stopped bottle, the whole may be cooled to 50° without any crystals forming; but, if the bottle be opened after it is thus cooled, crystallization immediately takes place, a quantity of caloric is given out, and the whole is converted almost into a solid mass.

SODALITE. A hard mineral, of a pale-green colour, containing from 25 to 27 per cent. of soda. It is found in Greenland, and on Vesuvius, and it is usually crystallized in dodecahedrons.

SODIUM. Sodium is the metallic base of soda; it is malleable, white like silver, and heavier than potassium, but lighter than water. It is obtained from soda in the same way as potassium is ob-

tained from potass, but it requires a stronger heat, and hence the operation is more difficult. The metal when obtained must be preserved in air-tight bottles, with a little naphtha, as air or moisture quickly convert it into soda, although, unlike potassium, it does not inflame when thrown upon water. Sodium combines with oxygen in three proportions, and it also unites with chlorine, iodine, cyanogen, fluorine, &c.

SODIUM, CHLORIDE OF; formerly called *Sea-Salt, Rock-Salt, Common Salt, Sal Gem, Dry Muriate of Soda, Sal Salsum, and Natrous Muria.*—Chloride of sodium, or common salt, is a substance too well known to require description. It is abundantly found in nature in the form of *rock-salt*, but, although obtained from sea-water, it does not exist in it as a chloride of sodium, but as a hydrochlorate of soda, (*see* ACIDS, HYDROGEN), and, indeed, whenever chloride of sodium is dissolved in water, a hydrochlorate of soda results, and, if this solution be evaporated to dryness, or crystallized, the chloride of sodium is again formed. It is soluble in rather less than three times its weight of water, and, as the application of heat does not increase its solubility, its crystals can only be obtained by slowly evaporating the water, without allowing it to cool until the crystals are formed. It is not affected by the air, but when found native, it is often rendered deliquescent by the presence of the chlorides of calcium or magnesium.

SODIUM, OXIDES OF. Sodium unites with oxygen in three proportions, forming the grey protoxide, which is obtained by heating sodium with pure dry soda; the deutoxide of sodium, which is commonly called SODA; and the peroxide, which is of an orange-colour, and is formed by burning the metal in a large quantity of oxygen gas. *See* SODA.

Sorbates. *See* MALATES, *and Acid, Sorbic.*

Spanish White. A name given to the precipitate formed by the solutions of bismuth when thrown into water.

Spar, Adamantine. A variety of corundum. *See* CORUNDUM.

Spar, Brown. A name given to an impure native oxide of manganese. *See* MANGANESE, OXIDES OF.

Spar, Calcareous. A name promiscuously given to all crystallized native carbonates of lime.

Spar, Derbyshire. A native FLUORIDE OF CALCIUM found in Derbyshire, and commonly called *Fluate of Lime.*

Spar, Dogtooth. A native carbonate of lime, which is found crystallized in groups of small six-sided pyramids.

Spar, Iron. A sort of quartz containing a large quantity of oxide of iron.

Spar, Ponderous. Native sulphate of barytes.

Spelter. A name used by artisans for ZINC.

Sphene. An ore of titanium. *See* TITANIUM, ORES OF.

Spirit, Bezoardic of Nitre. Liquid chlorine was called bezoardic spirit of nitre when it was obtained by distilling nitric acid with chloride of antimony, because by applying a pretty strong heat to the residuum, the white oxide of antimony, formerly called *Bezoar Mineral*, is obtained. *See* CHLORINE.

Spirit, Cupreous. A name given to the acetic acid, obtained by the dry distillation of acetate of copper. *See* ACID, ACETIC, *and* COPPER, ACETATE OF.

Spirit, Dephlogisticated, of Nitre. *See* ACID, NITRIC.

Spirit, Dephlogisticated of Salt. *See* CHLORINE.

Spirit, Diuretic of Sal Ammoniac. *See* AMMONIA.

Spirit, Dulcified, of Nitre. A name given to the ether obtained by nitric acid, and commonly called nitric ether. *See* ETHERS.

Spirit, Dulcified, of Salt. A name given to hydrochloric or muriatic ether. *See* ETHERS.

Spirit, Dulcified, of Vitriol. A name for sulphuric ether. *See* ETHERS.

Spirit, Fuming, of Nitre. Nitric acid containing some nitric oxide. *See* ACID, NITROUS.

Spirit, Glauber's Smoking, of Nitre. *See* ACID, NITROUS.

Spirit of Hartshorn. *See* AMMONIA, which was formerly prepared by distilling the horns of deer.

Spirit of Mindererus. A name given to a solution of acetate of ammonia.

Spirit of Nitre. *See* ACID, NITRIC, which is obtained from nitre.

Spirit of Nitre, Bezoardic. *See Spirit, Bezoardic, of Nitre.*

Spirit of Nitre, Dephlogisticated. *See Spirit, Dephlogisticated, of Nitre.*

Spirit of Nitre, Dulcified. *See Spirit, Dulcified, of Nitre.*

Spirit of Nitre, Fuming. *See Spirit, Fuming, of Nitre.*

Spirit of Nitre, Glauber's Smoking. *See Spirit, Glauber's Smoking, of Nitre.*

Spirit of Nitre, Phlogisticated. *See Spirit, Phlogisticated, of Nitre.*

Spirit, Philosophic, of Vitriol. This name for the hydrochloric (*muriatic*) acid is, perhaps, one of the most absurd that the ancients ever adopted; but it was only applied to the acid obtained by precipitating the oxide of antimony from the chloride by means of water, and concentrating the clear liquid which contains the hydrochloric acid. Thus, it is called spirit of vitriol, because it is concentrated in the same manner as sulphuric acid. *See* ACID, HYDROCHLORIC.

Spirit, Phlogisticated, of Nitre. *See* ACID, NITROUS.

Spirit of Sal Ammoniac. *See* AMMONIA, which is obtained from sal ammoniac.

Spirit of Salt. *See* ACID, HYDROCHLORIC.

Spirit of Salt, Dulcified. *See Spirit, Dulcified, of Salt.*

Spirit of Vitriol. A name given to dilute sulphuric acid. *See* ACID, SULPHURIC.

Spirit of Vitriol, Dulcified. *See Spirit, Dulcified, of Vitriol.*

Spirit of Vitriol, Philosophic. *See Spirit, Philosophic, of Vitriol.*

Spirit of Wine. *See* ALCOHOL.

Spirits, Acid. *See* ACIDS.

Spirits, Dulcified Acid. *See* ETHERS.

Spiritus Beguini. A hydrosulphuret of ammonia.

Spiritus Veneris. *See Spirit, Cupreous.*

Spodium. *See* POTASS. This name for potass comes from the Greek word *spodos*, signifying ashes, because this alkali is obtained from the ashes of vegetable substances.

Squamæ Æris. A name given to the peroxide of copper. *See* COPPER, OXIDES OF.

STALACTITES. Stalactites are minerals, consisting chiefly of carbonate of lime and magnesia; they have a peculiar fibrous or striated texture, and are found on the roofs of caverns, where they are formed by the dropping of water containing these earthy carbonates. *Stalagmites* have the same component parts as stalactites, and, indeed, they only differ from them in being found on the floors, and not on the roofs of caverns.

There is a large cave, called Wookey Hole, near Wells, in Somersetshire, which is entirely

lined with stalactites to a considerable thickness; it contains some curious petrifactions, among which are two bats, which appear to have been nailed up against the rock, and have been incrusted with carbonate of lime, by means of the water which is constantly trickling down the sides of the cavern.

STALAGMITES. A species of stalactites. *See* STALACTITES.

STANNATES. Compounds of the peroxide of tin (sometimes called stannic acid) with alkalies, &c.

Starch. *See* FARINA.

STEARINE. Animal fat has been found to contain a white crystallizable principle, to which the name of stearine is given; it forms the solid part of fat, is fusible at 100°, and is sparingly soluble in alcohol, but insoluble in water.

STEATITE. Steatite, or soap-rock, is a silicious mineral, having a specific gravity from 2.6 to 2.8. It occurs of various shades of grey, has hardly any lustre, and is sometimes spotted or veined. It consists of silica 64, magnesia 22, oxide of iron 3, and water 5, has a greasy feel, is found in Cornwall, and is much used by porcelain manufacturers.

Steatocrates. A name formerly given to that class of salts formed by the sebacic acid, and now called SEBATES.

Steel. *See* IRON, CARBURETS OF.

Stibium. An old name for antimony. *See* ANTIMONY.

Stone, Blue. *See* COPPER, SULPHATE OF.

Stone, Infernal. A name given to the fused nitrate of silver, which is used as a caustic. *See* SILVER, NITRATE OF.

Stone, Ponderous. A name formerly given to a native tungstate of lime.

Stones, Chalk. *See* CALCULI.

STRONTIA; formerly called *Strontian Earth, and Strontites.*—Strontia, or strontites, is an earth first discovered by Dr. Hope, who found it in the state of a carbonate at Strontian, in Argyleshire; this native carbonate is a rare mineral, but there is a sulphate of strontia found near Bristol in great abundance, and from it the earth and its compounds are usually prepared. Strontia is a greyish white earth, much resembling barytes in its appearance and properties; it has an acrid taste, is soluble in water, and may be crystallized. It is distinguished from other earths by its great specific gravity (which nevertheless is less than that of barytes) and the red colour which it gives to burning bodies when mixed with them. The red fire, which is so much used at the theatres, owes its colour to the presence of this earth.

Pure strontia is of no great use, but it is usually kept in the laboratory as a matter of curiosity; it is easily prepared by keeping the nitrate at a strong red heat for about an hour, at the end of which time all the acid will have flown off, and pure strontia will remain. This operation may be performed in a Hessian crucible, but not without danger of rendering the product impure, and very

small in quantity, as the crucible absorbs a large portion of it; it is, therefore, best to use a crucible made of platinum. Pure strontia may also be obtained by calcining an artificial carbonate, and indeed this is the most economical way of preparing it.

STRONTIA, CARBONATE OF. There is a native carbonate of strontia, found in Argyleshire, and, indeed, it was the first compound of the earth discovered; but, as this mineral is very rare, carbonate of strontia is usually prepared by boiling the native sulphate (so plentifully found near Bristol) in water, with an equal weight of common carbonate of potass; the boiling must be continued for two or three hours, and the whole must be often stirred, after which the carbonate, which is white and insoluble, will be found at the bottom of the liquid; it should be well washed with hot water, and dried by a gentle heat.

The carbonate of strontia is decomposed by most acids, and it is often very useful in the formation of the nitrate and other salts of the earth; it is insoluble in water, and, if exposed to a strong heat for some time, its acid flies off, and leaves pure strontia behind.

Strontia, Muriate of. *See* STRONTIUM, CHLORIDE OF.

STRONTIA, NITRATE OF. This is by far the most important salt of strontia, as it is used for obtaining the pure earth, and for making the red fire so much used at theatres, and which is

formed by mixing together 40 parts of dry nitrate of strontia, 13 of powdered sulphur, 10 of nitrate of potass, 4 of sulphuret of antimony, and enough charcoal to render the whole black. The mixture should be in very fine powder. Nitrate of strontia may be obtained by calcining the sulphate with charcoal, and treating the sulphuret obtained with dilute nitric acid; but, as in this manner of operating, a great part of the acid is decomposed by the disengaged sulphur; it is found better to form it by mixing the carbonate, (*see* STRONTIA, CARBONATE OF), with dilute nitric acid, and crystallizing the solution obtained, by evaporating it until a slight pellicle is formed, and then allowing it to stand in a cool place for two days, when crystallization will have taken place. Nitrate of strontia crystallizes in cubes, is very soluble in water, and its solution forms a test for sulphuric acid, with which it gives a white precipitate; but the nitrate of barytes is preferable as a test.

STRONTIA, SULPHATE OF. Sulphate of strontia is a native insoluble salt, of no importance for its own properties, but very useful in the manufacture of pure strontia and its compounds. It occurs crystalline, in great abundance near Wells and Bristol, and it is sometimes bluish, when it is called *celetine*.

It has a great specific gravity, is easily broken, and when boiled for some time in a solution of carbonate of potass, it is decomposed, and a carbonate results; it is also transformed into a sul-

phuret by calcination with an equal bulk of powdered charcoal.

STRONTITES. *See* STRONTIA.

STRONTIUM. Strontium is the metallic base, which forms by its combination with oxygen, the earth called strontia; it is procured by means of voltaic electricity, is of a dark colour, and has a specific gravity greater than that of sulphuric acid, but not much lustre. When strontium is put into water strontia is quickly formed

STRONTIUM, CHLORIDE OF; formerly called *Dry Muriate of Strontia.*—This substance is now looked upon as a compound of chlorine and strontium; it is easily obtained by dissolving carbonate of strontia in hydrochloric acid, and evaporating to dryness; it is soluble in water, and deliquesces in the air, but when acted upon by either of these means, it becomes converted into a hydrochlorate of strontia. It has no striking properties, and is seldom applied to any use.

STRONTIUM, OXIDE OF. *See* STRONTIA, which is a compound of strontium and oxygen.

STRYCHNIA. A new poisonous vegetable alkali, obtained from the *strychnos nux vomica* by digesting the powdered fruit (a sort of bean) first in nitric ether, and then in alcohol. By evaporating the alcoholic solution a substance is obtained, which being dissolved in water, and treated with a solution of potass, lets fall the strychnia in a crystalline state. It is white, bitter, inodorous, and very sparingly soluble in water, but by alcohol it is

easily dissolved, and at a red heat it is decomposed.

Strychnia, when taken inwardly, produces a locked-jaw, and soon proves fatal; one grain of it will kill a rabbit in five minutes. It combines with acids, forming soluble and crystallizable salts.

SUBERATES. Compounds of the suberic acid, or acid of cork, with alkalies, earths, &c. None of them are of any importance, but the suberates of lead, mercury, iron, tin, and silver, are insoluble, while those of alumina, lime, magnesia, and barytes, are soluble.

Sublimate, Corrosive. A name given to the perchloride of mercury, because it corrodes animal substances. *See* MERCURY, PERCHLORIDE OF.

Sublimate, Sweet. *See* MERCURY, PROTOCHLORIDE OF.

SUB-SALTS. Salts containing an excess of base. *See* SALTS.

SUBSTANCES, ANIMAL. Animal substances differ from most vegetables in containing a large quantity of nitrogen, and yielding ammonia by dry distillation; but these properties are not absolutely distinctive, as some substances of vegetable origin contain nitrogen, and also give out ammonia by the application of a red heat. (*See* AMMONIA.) The chief ultimate principles, or simple bodies, contained in animal substances, are hydrogen, oxygen, carbon, and nitrogen, and these are often combined with sulphur, phosphorus,

lime, magnesia, and soda. The proximate principles which are obtained from them are not very numerous; they give out ammonia at a red heat, and this ammonia has an empyreumatic smell like that of the vapour of burning wool. *See* PRINCIPLES.

Most animal substances absorb oxygen when exposed to the atmosphere, and they undergo the acetous and putrid fermentations with ease, but the vinous fermentation is never perceived in them.*

SUBSTANCES, COMPOUND. *See* BODIES, COMPOUND.

SUBSTANCES, PHOSPHORESCENT. *See* BODIES, PHOSPHORESCENT.

SUBSTANCES, SIMPLE. *See* BODIES, SIMPLE.

SUBSTANCES, VEGETABLE. Vegetables generally consist of hydrogen, oxygen, and carbon, but they sometimes contain nitrogen, sulphur, phosphorus, iron, manganese, hydrochloric acid, potass, soda, lime, magnesia, silica, and alumina; they may be separated either into proximate or ultimate principles, but, as the ultimate principles of all vegetables are nearly the same, the former mode of analysis is generally preferred. For the proximate principles of vegetables, *see* PRINCIPLES.

SUCCINATES. Compounds of the succinic acid,

* Milk is, however, capable of passing through the vinous fermentation; and, in consequence of this, the Tartars obtain a fermented liquor from mare's milk, which they call *koumiss*.

or acid of amber, with alkalies, &c.; they are of no use, but are generally soluble in water.

Sugar. Sugar is a well known vegetable substance, obtained from several plants; when pure it is crystallizable, colourless, very soluble in water, and sparingly so in alcohol. Our limits will not permit us to describe the process for obtaining sugar in the large way, and hence we shall only mention, that it is a compound of oxygen, carbon, and hydrogen, and has the curious property of augmenting the solubility of the earths in water. At a temperature of 50° a solution of sugar is capable of dissolving quick lime equal to half the weight of the sugar contained. The solubility of strontia is still more increased by it, but it does not exert nearly so powerful an action on magnesia and alumina.

Another very useful property of sugar is that of its preventing the poisonous effects of the salts and oxides of copper and lead; this is ascertained by some successful experiments that were made upon dogs, and its simplicity is in its favour.

Sugar, Acid of. *See* Acid, Oxalic, which is obtained by distilling nitric acid off powdered white sugar.

Sulphates; formerly called *Vitriols*, or *Vitrioiates*.—Salts consisting of sulphuric acid combined with alkaline bases. They generally have a bitter taste, afford sulphurets when heated to redness with charcoal powder, and are all de-

composed by barytes, which has a stronger affinity for sulphuric acid than any other alkali or earth.

The sulphates are an important class of salts. Those of barytes, strontia, and lead, and the subsulphate of mercury, are insoluble, and the sulphates of silver, lime, and potass, are sparingly soluble in water.

SULPHITES; formerly called *Sulphurocrates.*—Sulphites are saline compounds of the sulphurous acid, they differ from the sulphates in having a sulphureous smell; they are decomposed by the hydrochloric acid, and when exposed to air, or moistened with water, they become converted into sulphates.

SULPHUR. Sulphur, or *brimstone*, is a well known mineral production, which is yellow, hard, very brittle, and devoid of smell, but not entirely so of taste. Its specific gravity is 1.990; it is found in nature in a pure state, but more commonly in combinations of the metals, from which combinations it is obtained by exposing the ore to heat, and catching and condensing the vapours which arise, in large chambers, when it is melted, run into moulds, and sold under the name of *roll brimstone.* Sulphur unites with most of the metals, rendering them brittle, and often more fusible; these compounds are called sulphurets. In illustration of this fact, if a bar of wrought-iron at a white heat be rubbed with a piece of sulphur, the two bodies melt together, and run down in the state of a sul-

phuret of iron. If sulphur be heated to 185° it becomes very fluid, and part of it sublimes; at a stronger heat it thickens, but, if allowed to cool, its former fluidity returns before it becomes solid.

Besides the metallic sulphurets, which are very numerous, we also have sulphurets of carbon, phosphorus, potass, soda, and the earths. Sulphur combines with hydrogen, forming sulphuretted hydrogen, and with oxygen in at least four proportions, forming the hyposulphurous, the sulphurous, the hyposulphuric, and the sulphuric acids. By melting sulphur, and suddenly pouring it into a cool vessel, a part of it crystallizes in the form of needles.

Sulphur, Alcohol of. This name was given to the sulphuret of carbon, because it is liquid and combustible. *See* CARBON, SULPHURET OF.

Sulphur, Alkaline Liver of. A name given to SULPHURET OF POTASS.

Sulphur, Balsam of. A solution of sulphur in oil.

SULPHUR, CARBURET OF. *See* CARBON, SULPHURET OF.

SULPHUR, CHLORIDE OF. A red fuming liquid, consisting of sulphur and chlorine, and obtained by heating the former in chlorine gas; it has a specific gravity of about 1.600, is volatile at 200°, and when mixed with water it is decomposed.

Sulphur, Flowers of. Sulphur, when sublimed, condenses in the form of a fine powder, which is

commonly called by the above name. *See* SULPHUR.

Sulphur, Livers of. Alkaline and earthy sulphurets.

Sulphur, Milk of. A name given to a very light coloured sulphur, obtained by the decomposition of any alkaline or earthy hydrosulphuret by an acid.

SULPHUR, PHOSPHURET OF. *See* PHOSPHORUS, SULPHURET OF.

Sulphur, Volatile Liver of. Sulphur, Volatile Tincture of. Names given to a hydrosulphuret of ammonia, which is very volatile.

Sulphurs. See SULPHURETS.

SULPHURETS. Compounds of sulphur with alkalies, earths, metals, carbon, &c. The alkaline and earthy sulphurets were formerly called livers of sulphur; they are soluble in water, at the same time being converted into hydrosulphurets, that is, compounds of sulphuretted hydrogen instead of sulphur. *See* HYDROSULPHURETS. The alkaline and metallic sulphurets are chiefly used for obtaining sulphuretted hydrogen, which they give out when treated with a diluted acid.

SULPHURETS, HYDROGURETTED, OR HYDROGENATED. A name given to those alkaline sulphurets which contain some hydrogen, but not enough to constitute hydrosulphurets; they are obtained by heating the hydrosulphurets.

Sulphurocrates. See SULPHITES.

SUPER-SALTS. Salts containing an excess of acid. *See* SALTS.

SWINESTONE, OR STINKSTONE. Swinestone, or fetid carbonate of lime, consists chiefly of lime, carbonic acid, and sulphuretted hydrogen, or sulphuret of lime. It may be known by the disagreeable odour of rotten eggs, which it gives out when rubbed and breathed upon.

Sylvan. A name given by Kirwan to the metal commonly called tellurium. *See* TELLURIUM.

T.

TALC. Talc is a well known mineral substance, chiefly consisting of silica. It is divisible into very thin laminæ, which are transparent like glass, and flexible, but not elastic. Talc is of a reddish or greenish white colour, and the laminated variety has a specific gravity, from 2.7 to 2.8, and consists of 62 silica, 27 magnesia, and 1.5 of alumina.

Talc, Earth of. *See* MAGNESIA.

Talcum. An old name for magnesia, which is an earth forming a component part of the mineral called talc.

TANNIN, OR TAN; formerly called *Astringent Principle.*—Tannin is a vegetable principle, contained in oak-bark, and all those vegetables commonly called astringent; it generally accompanies the gallic acid, and it is used in the laboratory as a test for gelatine, which it precipitates in the

form of a tough insoluble matter. It is obtained by putting powdered carbonate of potass into a strong infusion of galls, and collecting, washing, and drying the precipitate formed; it is soluble in water, of a brown colour, and somewhat resembles resin. *See* GELATINE.

Tantalite. A native columbate of iron and manganese, found in Sweden. It occurs in masses, or crystallized in acute octahedrons, and it consists of columbic acid 83, oxide of iron 12, oxide of manganese 8. *See* COLUMBIUM.

Tantalum. *See* COLUMBIUM.

Tar, Mineral. Impure naphtha. *See* NAPHTHA.

Tartar. A name given to the supertartrate or bitartrate of potass.

Tartar, Aëriated. *See* POTASS, CARBONATES OF.

Tartar, Cream of. *See* POTASS, BITARTRATE OF.

Tartar Emetic. A name given to a tartrate of potass and antimony, which is used as an emetic. *See* POTASS, TARTRATES OF.

Tartar, Oil of. A name given to a solution of carbonate of potass, obtained by exposing the salt to the action of air, when it deliquesces into a liquid of an oily consistency.

Tartar, Photocrated. Phosphate of potass.

Tartar, Salitated. *See* POTASSIUM, CHLORIDE OF.

Tartar, Salt of. *See* POTASS, CARBONATES OF.

Tartar, Soluble. A name given to the neutral tartrate of potass, to distinguish it from the bitartrate, which is very insoluble in water. *See* POTASS, TARTRATES OF.

Tartar, Sulphurous. *See* POTASS, SULPHITE OF.

Tartar, Tartarised. A name given to the neutral tartrate of potass. *See* POTASS, TARTRATES OF.

Tartar, Vitriolated. *See* POTASS, SULPHATE OF.

Tartar, Volatile Vitriolated. A name given to the sulphite of potass, because it always has a sulphureous smell.

Tartarine. A name given by Kirwan to the alkali called POTASS.

TARTRATES. A class of salts formed by the combination of tartaric acid with alkalies, earths, &c. The alkaline tartrates are soluble, but when combined with another proportion of acid their solubility is sometimes diminished. The earthy tartrates are generally insoluble, and the tartaric acid forms several triple salts, such as the tartrate of potass and antimony, &c.

TELLURETTED HYDROGEN. A compound of hydrogen and tellurium, commonly called hydrotellurous acid, as it combines with alkalies. *See* ACID, HYDROTELLUROUS.

TELLURIUM. A brittle whitish metal, obtained from those gold ores commonly called *aurum graphicum*, by dissolving them in a mixture of nitric

and hydrochloric acids, diluting the solution with water, and adding pure potass in excess, by which means the oxides of all the metals are precipitated, and that of tellurium is redissolved. The solution being separated by a filtre, it is saturated with hydrochloric acid, which precipitates the pure oxide, and this, when mixed with $\frac{1}{12}$th of its weight of charcoal, and heated in a glass retort, yields the tellurium, which sublimes into its neck.

Tellurium has a specific gravity of 6.115, a foliated fracture, and a brilliant metallic lustre; it is about as volatile as arsenic, and before the flame of the blow-pipe it burns with a greenish flame, being converted into a white oxide, and giving out a pungent smell.

Tellurium is soluble in chlorine and nitric acid, as well as the sulphuric acid, to which it gives a purple colour. Neither the metal nor its compounds are of any use, and the mere addition of water decomposes its solutions. Tellurium combines with sulphur, oxygen, and chlorine, and with hydrogen it forms two compounds, namely, hydrotellurous acid, or telluretted hydrogen, and hydruret of tellurium.

TELLURIUM, HYDRURET OF. This is a compound of hydrogen and tellurium, which differs from the hydrotellurous acid in the proportions of its component parts, and in being solid instead of gaseous.

TELLURIUM, ORES OF. The ores of tellurium are not very numerous, and they differ but little from each other; they are metallic, and are generally rich in the metal, although the ores themselves are not found in large quantities. *Aurum graphicum, aurum problemăticum,* and *aurum paradoxicum,* are all old names for an ore of tellurium containing gold, and some impurities. Besides this we have the *yellow ore,* containing about 20 per cent. of lead, and the *black ore,* which contains still more lead, and some other metals.

TELLURIUM, OXIDE OF. We have but one oxide of tellurium. It is white, and may be obtained by burning the metal, or by decomposing its solutions by an alkali, taking care not to add the latter in excess, as by this means the oxide would be redissolved. It contains about 83 per cent. of metal, but has never been applied to any use.

TELLURIUM, SULPHURET OF. Tellurium and sulphur, when fused together, easily combine, forming a grey metallic brittle mass, which is a sulphuret of tellurium.

Terra Ponderosa. *See* BARYTES.

TESTS, CHEMICAL. Chemical tests are those substances which, when added to another substance, indicate by a change in colour, smell, &c. what are its component parts.

For a table of chemical tests, and their effects, see Note 11, *at the end of this volume.*

THORINA. Thorina is an earth lately disco-

vered in a species of *gadolinite.* It is presumed to be a metallic oxide, and it much resembles zirconia in its properties.

Pure thorina is white, and has a strong affinity for carbonic acid, which it quickly absorbs from the atmosphere; it differs from zirconia, in forming a crystallizable compound with sulphuric acid; unlike alumina, it is insoluble in a solution of potass, and with oxalic acid it forms an insoluble salt.

THORINUM, OR THORNIUM. The supposed metallic base of the earth called thorina.

THORNIA. *See* THORINA.

THORNIUM. *See* THORINUM.

TIN; formerly called *Jupiter.*—Tin is a well known white metal, having a specific gravity of 7.291, and being fused at a heat of about 442° of Fahrenheit's thermometer. It is very malleable and flexible, and when bent it gives out a peculiar crackling noise. According to Chaptal, it melted in a crucible well lined with charcoal, and kept in fusion for about ten hours, it becomes whiter, harder, and more sonorous.

Tin foil consists of tin nearly in a state of purity, but what is commonly called *block-tin, or tin-plate,* is nothing more than thin iron-plate coated with tin, and this operation is performed by immersing the iron in the melted metal.

Tin may be dissolved in the sulphuric and hydrochloric acids, with or without the assistance of

heat; in both cases a protosalt is formed, and, if the hydrochloric acid be used, or, if the sulphuric acid be dilute, a small quantity of fetid hydrogen gas is disengaged; but if the metal be acted upon by concentrated sulphuric acid, a part of the acid is decomposed, giving rise to sulphurous acid gas. When tin is digested in moderately concentrated nitric acid, great heat is produced, a quantity of nitric oxide is given out, and a peroxide of tin is precipitated; but, if very weak nitric acid, or a solution of chlorine is used, the metal may be dissolved without difficulty, but the action should not be rapid.

The best test for tin is hydrochlorate of gold, for, if metallic tin, or any of its protosalts be mixed with it, an abundant purple precipitate is formed; this precipitate is commonly called *purple powder of Cassius;* it consists of peroxide of tin combined with oxide of gold, and may be properly called STANNATE OF GOLD.

Tin easily unites with most of the metals, and with phosphorus, iodine, &c.; it also forms two sulphurets, two chlorides, and two oxides.

Tin, Ashes of. A protoxide of tin obtained by heat. *See* TIN, OXIDES OF.

TIN, BICHLORIDE OF. *See* TIN, PERCHLORIDE OF.

TIN, BISULPHURET OF; formerly called *Aurum Musivum, Aurum Mosaicum, and Mosaic Gold.* —A compound of tin with twice as much sulphur

as is contained in the sulphuret.—*See* TIN, SULPHURETS OF.

TIN, CHLORIDES OF. There are two chlorides of tin.—The protochloride, which is easily obtained by evaporating the solution of tin in hydrochloric acid to dryness, and the perchloride, or bichloride is obtained by distilling 6 parts of tin, 1 of mercury, and 30 of bichloride of mercury (the whole being previously well mixed) in a glass retort, to which a receiver is luted. The protochloride is a whitish crystalline, solid, volatile at a red heat, and forming a protohydrochlorate or protomuriate when dissolved in water. The perchloride is a fuming colourless liquid, which, on being poured into water, immediately becomes converted into a solid hydrated perchloride, which soon afterwards dissolves in the water, forming a perhydrochlorate. *See* TIN, HYDROCHLORATES OF.

TIN, HYDROCHLORATES OF; formerly called *Muriates of Tin.*—Hydrochloric acid easily combines with both the oxides of tin. The protohydrochlorate (*protomuriate*) is formed by dissolving the metal in hydrochloric acid; it is used as a test for gold, with the solutions of which it gives a purple precipitate, (*see* TIN); but, if long kept, its oxide becomes peroxydised. The perhydrochlorate (*permuriate*) is formed by dissolving the metal, with or without the assistance of heat, in liquid chlorine, or in a mixture of the nitric and hydrochloric acids; care should be taken that the action is not

too strong, or some peroxide will be precipitated. This last mentioned salt is used by dyers under the name of solution of tin.

Tin, Muriates of. *See* TIN, HYDROCHLORATES OF.

Tin, Nitrate of. If tin-foil be digested for some time in very dilute nitric acid, a yellow uncrystallizable solution of nitrate of tin is obtained; it is a protonitrate, but, if exposed to the air, or partly evaporated, it is decomposed, and a peroxide of tin precipitates.

TIN, ORES OF. The ores of tin are rather scarce in other countries, although they occur in large quantities in Cornwall. The commonest is *the impure oxide*, which has a specific gravity from 6.5 to 7, and is generally of various shades of brown or black. It is often found crystallized, but when massive, and of a fibrous texture, it is called *wood-tin*.

Besides this we have a *native sulphuret of tin*, containing copper, iron, &c. It is a rare mineral, having a metallic lustre, and a yellowish, or greyish colour. It is never worked for the metal, and is only found in Cornwall. The native oxide of tin is distinguished by its property of being soluble in a solution of pure potass.

For the analysis of tin ores, see Note 9, at the end of this volume.

TIN, OXIDES OF; formerly called *Calces of Tin*. —The protoxide of tin is separated from the protosalts, and the peroxide from the persalts by the

addition of potass, but, if it be added in excess, the precipitate is redissolved, as these oxides form soluble compounds with alkalies. A better method of obtaining the peroxide is by digesting the pure metal in moderately strong nitric acid, when much heat and nitric oxide are disengaged, and a hydrated peroxide, of a white colour, is precipitated. This, when heated to redness, yields the pure yellow peroxide, containing about 77 per cent. of metal.

The peroxide of tin is found native, and from its properties of combining with alkalies, it is sometimes called stannic acid, its compounds with alkalies being called stannates. The protoxide may be obtained by heat as well as by precipitation; it is of no great importance, but is useful in the laboratory for forming the salts of tin.

Tin, Oxymuriate of. An old name for the perchloride of tin. *See* TIN, CHLORIDES OF.

TIN, PERCHLORIDE OF; formerly called *Libavius's Fuming Liquor, and Oxymuriate of Tin.*—A compound of tin with twice as much chlorine as is contained in the chloride or protochloride; it is sometimes called bichloride of tin. *See* TIN, CHLORIDES OF.

TIN, PERHYDROCHLORATE OF; formerly called *Oxymuriate of Tin, and Permuriate of Tin.*—A compound of hydrochloric acid with the peroxide of tin. *See* TIN, HYDROCHLORATES OF.

Tin, Permuriate of. See TIN, PERHYDROCHLORATE OF.

TIN, PEROXIDE OF; formerly called *Yellow, or White Oxide of Tin.*—A compound of tin with the largest portion of oxygen. *See* TIN, OXIDES OF.

TIN, PROTOCHLORIDE OF; formerly called *Muriate of Tin.*—A compound of tin with the first proportion of chlorine; it is often called simply the chloride of tin. *See* TIN, CHLORIDES OF.

TIN, PROTOHYDROCHLORATE OF; formerly called *Protomuriate of Tin, and Muriate of Tin.*—A compound of hydrochloric acid with the protoxide of tin. *See* TIN, HYDROCHLORATES OF.

Tin, Protomuriate of. *See* TIN, PROTOHYDROCHLORATE OF.

TIN, PROTOXIDE OF; formerly called *Grey Oxide, or Calx of Tin, and Ashes of Tin.*—A compound of tin with the smallest portion of oxygen. *See* TIN, OXIDES OF.

Tin, Putty of. A name given to the protoxide of tin obtained by heat. *See* TIN, OXIDES OF.

Tin Pyrites. An ore of tin consisting of the metal combined with sulphur, iron, and copper. *See* TIN, ORES OF.

TIN, SULPHURETS OF. There are two sulphurets of tin, namely, the sulphuret, which is a useless grey brittle substance, obtained by fusing the metal with sulphur, and the bisulphuret, commonly called *aurum musivum*, or *mosaic gold.*

The latter is of a yellowish colour and flaky structure, having at the same time a metallic lustre. It is used by artists to give a beautiful co-

lour to bronze, and may be formed by mixing equal parts of sulphur and peroxide of tin in a Florence flask, and exposing the whole to a heat gradually raised to redness, when part of the sulphur, and all the oxygen evaporate, leaving the bisulphuret of tin in the bottom of the flask.

TIN, SUPERSULPHURET OF. *See* TIN, BISULPHURET OF.

Tin, White Oxide of. Tin, Yellow Oxide of. *See* TIN, PEROXIDE OF.

The peroxide of tin obtained these two names, because when hydrated, or containing water, it is white, and when deprived of water by heat, it becomes yellow.

Tincal. A name given to the impure subborate of soda brought from the East Indies.

Tinctures. Infusions or solutions of substances in alcohol.

Tin-Glass. A name given to BISMUTH.

Titanite. An ore of titanium, containing the metal combined with oxygen; it is usually opake, but sometimes translucent, and it is hard enough to scratch glass. *See* TITANIUM, ORES OF.

TITANIUM. Titanium is a brittle metal, resembling copper in colour, and having a fine lustre. It easily tarnishes by exposure to the air, but, as it can never be brought to perfect fusion by the heat of our furnaces, and the small quantities which are obtained, being never perfectly metallic, very little is known of its properties. It

combines with chlorine, and unites with oxygen to form three different oxides.

TITANIUM, ORES OF. The principal ore of titanium is the mineral, commonly called *rutile, red schorl, or titanite;* but this metal has also been met with in the state of an oxide, combined with iron, in the valley of Menachan, and hence the oxide of titanium was formerly called *menachine.*

Besides the ores above-mentioned we also have the following minerals, containing the oxide of titanium, viz. *iserine, nigrine, sphene or rutile, and octahedrite. See Note* 19.

TITANIUM, OXIDES OF. Titanium, as we have already mentioned, combines with oxygen in three proportions. The protoxide, which is blue, may be obtained by simply burning the metal; the red deutoxide occurs native, and the white peroxide is procured by fusing the deutoxide with potass, and it is by some supposed to be merely a compound of the deutoxide with water. The oxides of titanium are sometimes used by porcelain manufacturers, but otherwise they are not great articles of commerce.

Tombac. An alloy of copper, tin, and zinc. *See* ALLOY.

TOPAZ. A well known transparent, hard, and crystallizable mineral, found in several parts of the world, and consisting chiefly of alumina. Common topaz is of a wine-yellow colour.

TOURMALIN. A silicious mineral, containing

about 39 per cent. of alumina, and having a splendent or vitreous lustre; it is not quite so hard as quartz, and it is found in the form of crystals, which are striated, of various colours, have a specific gravity of 3., and become electric by heat. These crystals are always translucent when held up to the light, and viewed in a particular direction, but otherwise they are opake. A certain blue variety of tourmalin is called *indicolite*.

TRAP. A name given to several stones which resemble each other in most of their characters. They are generally massive, and of a greyish, bluish, or blackish colour. *Whinstone* is a species of trap.

TUNGSTATES; formerly called *Baralithocrates*. —Compounds of tungstic acid with alkalies, earths, or metallic oxides. They are not of much consequence, but those which are soluble have a metallic and caustic taste.

Those consisting of tungstic acid combined with lime, barytes, and strontia, are insoluble, but the tungstates of the alkalies and magnesia are soluble.

TUNGSTEN, OR TUNGSTENUM. Tungsten is a brittle metal of steel-grey colour, having a specific gravity of 17.40, and possessing a fine lustre. It is difficult of fusion, and is chiefly obtained from a mineral called wolfram. When heated in the air, it forms an oxide, and it also combines with sulphur, but neither the metal nor its

compounds are at present made useful in commerce.

The tungstic acid, or peroxide of tungsten, is obtained from the mineral called *wolfram*, (*see* TUNGSTEN, ORES OF), by pulverizing it, and heating it in a flask for some time with five or six times its weight of hydrochloric acid. The tungstic acid, in an impure state, remains undissolved, while the other component parts of the mineral are taken up; it is to be digested with a sufficient quantity of liquid ammonia, which dissolves it, and the solution (tungstate of ammonia) is evaporated to dryness, and heated to redness, when the ammonia flies off, and leaves the pure acid behind. The acid thus obtained may be reduced to the metallic state by mixing it with a small quantity of oil, and exposing it to an intense heat in a crucible lined with charcoal, or it may be reduced to the state of a brown oxide (tungstous acid, or oxide of tungsten) by igniting it in a glass tube, and at the same time causing hydrogen gas to pass over it.

Tungsten, Acid of. *See* ACID, TUNGSTIC.

TUNGSTEN, ORES OF. There are two ores of tungsten from which the metal is generally extracted; the first, which consists of tungstate of lime, with a small portion of silica, is commonly called *scheelium*, tungsten, or heavy stone, and it is found in England, Sweden, Saxony, &c. The second, commonly called wolfram, consists of

tungstic acid 64, oxide of manganese 22, and oxide of iron 13.5. It is found in several parts of England and Germany.

TUNGSTEN, OXIDE OF. Tungsten combines with oxygen in two proportions, forming an oxide and an acid; the oxide is of a brown colour, and may be obtained either by combining the metal directly with oxygen, or by partly deoxydating tungstic acid. *See* TUNGSTEN.

Turbith, Mineral. An old name applied to the insoluble yellow subsulphate of mercury. *See* MERCURY, SULPHATES OF.

Turbith, Nitrous. A subnitrate of mercury formed by exposing the nitrate to heat.

Turpethum Nigrum. Protoxide of mercury. *See* MERCURY, OXIDES OF.

Turpethum Album. A name formerly given to the protochloride of mercury. *See* MERCURY, PROTOCHLORIDE OF.

Tutenag. An Indian name for zinc; the same name is also applied to an alloy of copper.

Tutty. A name given to the oxide of zinc.

U. and V.

VAPOUR. A common term applied to those aëriform fluids which are not permanently elastic, but condense into liquids or solids at common temperatures.

VERATRIA, OR VERATRINE. A newly disco-

vered vegetable alkali, obtained from the *veratrum album, or white hellebore*, and some other plants. It is white and pulverulent, has an acrid taste, and very small doses of it produce vomiting and death. It is sparingly soluble in water, very soluble in alcohol, and by a heat of 122°, it fuses into a substance resembling wax; it has decided alkaline properties, combines with acids, and appears to consist of oxygen, hydrogen, and carbon, without any nitrogen.

Verdigrise. An impure compound of oxide of copper with the acetic acids. *See* COPPER, SUB-ACETATE OF.

Verdigrise, Crystallized. Verdigrise, Distilled. A name given to the crystallized acetate of copper, obtained by dissolving common verdigrise in distilled vinegar, and evaporating the solution. *See* COPPER, ACETATE OF.

Verditer. " An impure carbonate of copper, obtained by putting chalk into a nitric solution of copper. *See* COPPER, CARBONATE OF.

Vermilion. A bisulphuret of mercury. *See* MERCURY, SULPHURETS OF.

Vinegar, Aromatic. Aromatic vinegar merely consists of strong acetic acid, scented by means of essential oils, which it has the property of dissolving. The oils said to be made use of by Henry are oil of lavender, oil of cloves, and the oil of the sweet flag (*calamus aromaticus*); the proportion of each depends entirely upon taste.

Another sort of aromatic vinegar, commonly called *vinaigre des quatre voleurs*, is used for counteracting contagion, and is formed by macerating 4 oz. of rosemary-tops, 4 oz. of sage-leaves, 2 oz. of lavender-flowers, and 2 drachms of cloves, in 8 pounds of common vinegar, and straining off the clear liquid after four days.

Vinegar, Chalybeate. A name given to a solution of acetate of iron, obtained by digesting the metal in vinegar. *See* IRON, ACETATE OF.

Vinegar, Distilled. Vinegar, Radical. *See* ACID, ACETIC, which is obtained from vinegar.

VIOLINE. An acrid, bitter, alkaline principle, said to be lately discovered in the violet. It is very poisonous, but its other properties have not yet been examined.

Vitriol, Blue. *See* COPPER, SULPHATE OF.

Vitriol, Green. Vitriol, Martial. A name for the protosulphate of iron. *See* IRON, SULPHATES OF.

Vitriol, Roman. *See* COPPER, SULPHATE OF.

Vitriol, Rose-coloured. A name given to a sulphate of cobalt.

Vitriol, White. *See* ZINC, SULPHATE OF.

Vitriols. *See* SULPHATES.

ULMIN. A peculiar vegetable principle, which exudes from the trunk of a species of elm, supposed to be the *ulmus nigra*. It has been lately examined by Klaproth, and found to differ from all other known substances. Like most other ve-

getable bodies, it consists of oxygen, hydrogen, and carbon.

ULTRAMARINE. A blue pigment, prepared from the mineral called *lapis lazuli*. The following process for preparing it is taken from a work entitled *The Chemist:*

"The stones called lapis lazuli are made red-hot, and thrown into water, to make them pulverize easily; they are then reduced to a fine powder, and intimately combined with a varnish formed of resin, wax, and boiled linseed-oil. It is then of the consistence of paste, and is put into a linen cloth, and repeatedly kneaded with hot water. The first water is thrown away, the second gives a blue of the first quality, and the third yields one of less value. This process is founded on the property of the earthy matter of the stone adhering more firmly to the resin than the colouring matter, which is by this means extracted."

There are two compounds which much resemble ultramarine in colour; the first is the *Egyptian azure*, which was used by the old Italian artists; it may be formed by strongly heating a mixture of 15 parts of carbonate of soda, 20 of powdered opake flints, and 3 of copper filings; the calcination should be continued for two hours, and when the whole is pulverized, it has a fine azure-blue colour. The second composition, which resembles ultramarine, is obtained by adding phosphate of soda to a solution of nitrate of cobalt, and calcin-

ing the blue precipitate, which is formed, with eight times its weight of alumina.

Umber. An impure native oxide of iron and manganese.

Uran Mica. See Uranite.

Uranite. A mineralogical name given to an impure native oxide of uranium. It somewhat resembles mica, and is of a brilliant green colour.

URANIUM. A hard brittle metal, of a brownish or greyish colour. It is very difficult of fusion, and has hitherto been obtained only in minute quantities. It has a specific gravity of 8.1, and, if heated in the air, it becomes converted into a black protoxide, but without the assistance of heat no such effect is produced.

Uranium is soluble in nitric acid, and its salts are generally of a green colour, but, as it is a very scarce metal, its other properties are not known.

Metallic uranium may be obtained by digesting its ores in nitric acid, and treating the solution formed with pure potass, taking care not to add the alkali in excess, as it would redissolve the precipitate formed. This precipitate, which is a peroxide, is to be mixed with wax, put into a crucible lined with charcoal, and exposed to a most intense heat for an hour, when a button of uranium is obtained.

URANIUM, ORES OF. The ores of uranium are not abundant, and they are never reduced in the large way. The chief of them are uran-glimmer, or uran-mica, uran-ochre, and pitchblend; the

two first contain the metal in the state of an oxide, and pitchblend is commonly called a native sulphuret of uranium, but it is in reality an oxide, containing silica and sulphuret of lead.

URANIUM, OXIDES OF. Uranium combines with oxygen in two proportions, forming the protoxide, which is black, and forms salts by its union with acids, and the yellow peroxide, which has acid properties, combines with alkalies, and is sometimes called *uranic acid.* The former is easily obtained by heating metallic uranium to redness in an open vessel, and the latter is formed by dissolving the protoxide in nitric acid, and precipitating it by potass, taking care not to add the alkali in excess. *See* URANIUM.

URANIUM, PEROXIDE OF. A compound of uranium with the largest proportion of oxygen. *See* URANIUM, OXIDES OF.

URANIUM, PROTOXIDE OF. A compound of uranium with the smallest proportion of oxygen. *See* URANIUM, OXIDES OF.

URATES, OR LITHATES; formerly called *Zoolithocrates.* —Saline compounds of uric or lithic acid with alkaline bases. None of these salts are of any consequence.

UREA. A peculiar substance obtained from urine, and consisting, according to Dr. Prout, of nitrogen 43.40, oxygen 26.40, carbon 19.40, hydrogen 10.80. It unites with some acids without decomposition, is soluble in water or alcohol, and by a strong heat it may be melted, and partly

sublimed without decomposition. Urea combines with most of the metallic oxides, but it is decomposed by potass, soda, and the alkaline earths.

W.

WADD. A name for plumbago, which is properly called a supercarburet of iron. *See* IRON, CARBURETS OF.

Wadd, Black. A native oxide of manganese, which takes fire when mixed with linseed-oil. *See* MANGANESE, ORES OF.

WATER. Water is one of the most generally known bodies in the world; it consists of 85 parts of oxygen, and 15 of hydrogen, and may be decomposed by galvanism, or merely by chemical affinity. To decompose water by the first method, it is only necessary to have a large tube filled with the fluid, and being stopped at each end with a cork, into which a metallic wire is introduced; the points of the wires should project some distance into the water, and their other ends must be connected with the opposite poles of a galvanic battery or pile, when bubbles of gas will rise, which, if combined, and deprived of part of their caloric by combustion, will re-form water. To decompose water by chemical affinity, a small piece of potassium must be quickly introduced under a glass bell full of water, standing in the pneumatic-trough. Directly on coming in contact with the water, the potassium will combine

with oxygen to form potass, and some hydrogen gas (the other component part of the water) will rise into the glass bell.

Water exists in three different states, viz. solid, as in ice, or combined with crystals, or other solids, when it is deprived of a large portion of its caloric. Liquid, as in common water, which contains more caloric than ice; and gaseous, as in steam, which consists of water combined with so much caloric as to cause its particles to repel each other.

Water can never be procured quite free from all other substances, but that obtained by distillation is nearly pure. Spring-water generally contains supercarbonate of lime and iron, as well as some sulphate of lime, and hydrochlorate of soda; the two first impurities may generally be precipitated by boiling, but the two last will remain in solution, and can only be separated by distillation. The purest water which nature affords is clean snow, or rain, and next to it comes that of some lakes and rivers, but in all nice operations distilled water should be used.

Pure water has no taste, it dissolves a greater number of bodies than any other fluid, and heat generally assists the solution of substances in it. It boils at a heat of 212°, solidifies at 32°, and the specific gravity of all other fluids and solids is taken from it; thus, if I call the specific gravity of water 1.000, that of concentrated sulphuric acid

will be 1.850, that is, a given bulk of sulphuric acid is eight tenths and five hundredths heavier than an equal bulk of pure water. *For a table of the solubility of salts in water, see Note 7, at the end of this volume.*

Water, Hepatic. Water impregnated with sulphuretted hydrogen. It is used as a test for metals. *See* HYDROGEN, SULPHURETTED.

WATER, OXYGENATED. Although water cannot be combined with oxygen by means of oxygen gas, yet, if peroxide of barium be dissolved in it, the addition of diluted sulphuric acid will again precipitate the barium in the state of sulphated protoxide, thus leaving the water combined with a part of the oxygen before contained in the peroxide.

Oxygenated water is used for recovering white lead (carbonate of lead), which has been blackened by sulphuretted hydrogen, and it produces this effect by forming an acid with the sulphur contained in it, and at the same time oxydating the reduced lead. It has been used with great success in restoring old drawings.

Waters, Distilled. Distilled waters merely consist of water holding a small quantity of the essence of some plant in solution, which it is caused to imbibe by distilling it with the vegetable, by which we wish it to be scented; as they are much used for domestic purposes, as well as in pharmacy, we shall give a few general directions with regard to their preparation.

The still used, is generally made of copper, tinned inside; it has a pewter worm inclosed in a tub of water (the worm-tub), and the cucurbit, or bottom part of the still, is separate from the head, and is generally heated by means of a round stove, or furnace made for the purpose. The vegetable to be distilled is put into the water in the cucurbit, but as it should not be allowed to touch the bottom, a small grating is generally introduced, which raises it about an inch.

The heat applied should not be too quick; the water ought to simmer, but, if boiled hard, the product obtained generally has a disagreeable smell, in consequence of the formation of a small quantity of empyreumatic oil, from which it can only be freed by long keeping and exposure to air.

The following table shows the quantity of any plant which should be used to a given quantity of water, and also the quantity of the water which should be distilled over and kept for use.

Bruised dill-seed	1 lb.	Water	10 lbs.	Distil off	8 lbs.
Bruised cinnamon	1	—	12	—	8
Cassia	1½	—	14	—	10
Fennel-seeds	1½	—	16	—	12
Dried peppermint	3	—	24	—	16
Dried spearmint	3	—	24	—	16
Allspice	1	—	10	—	8
Roses	6	—	24	—	8
Dried pennyroyal	3	—	20	—	16
Lemon-peel, or Orange-peel	2	—	14	—	10
Rosemary flowers	1	—	11	—	8
Chervil leaves	1	—	11	—	8

Camomile flowers .	8 lbs.	Water	72 lbs.	Distil off	48 lbs.
Caraway-seeds . .	1	——	12	———	8
Lavender flowers .	2	——	14	———	10

If distilled waters are to be kept for any length of time, each gallon of them should be mixed with 5 ounces of proof-spirit.

WATERS, MINERAL. Mineral waters are those which contain a considerable quantity of any impurity. In analyzing them care should be taken to collect any gaseous products which they may afford, and the earthy and saline impurities are to be separated by chemical re-agents and evaporation.

The following are the appearances produced by different substances when contained in water.

Water containing carbonic acid is brisk and sparkling; it reddens tincture of litmus when fresh, but, if boiled, the carbonic acid flies off, and the water will no longer redden tincture of litmus, unless an uncombined fixed acid be present.

Lime, or any of its combinations, is discovered by oxalate of ammonia, with which it gives a white precipitate.

Sulphuric acid is always precipitated in the form of a white sulphate of barytes by the addition of nitrate of barytes.

Nitrate of silver lets fall an insoluble chloride, when added to water containing hydrochloric (*muriatic*) acid.

Uncombined alkalies change the yellow colour

of turmeric to brown, and ammonia may be distinguished from the fixed alkalies by its smell.

Earthy and metallic carbonates are precipitated by boiling.

Iron gives a blue precipitate with ferro-hydrocyanate of potass.

Magnesia and alumina are precipitated by ammonia.

Sulphuretted hydrogen blackens the salts of lead, and may often be detected by its smell.

Copper, when contained in mineral waters, gives a fine blue colour if mixed with pure ammonia.

Mineral waters are often used in medicine, and many of them may be exactly imitated by art.

WAX. A well-known substance, procured by bees from plants; it is by some supposed to exist in the plants ready formed, while others affirm that it is actually made by the insects themselves. Pure wax has no taste, and very little smell; it is soluble in oils, is easily fused, and by a strong heat it is decomposed. It is rendered colourless by the action of air and water, consists, according to Thenard, of oxygen 5.544, hydrogen 12.672, and carbon 81.784, and when digested in alcohol, a part of it is dissolved, which part is called *cerin*. When wax is exposed to dry distillation, a fluid oil is obtained, which is called *oil of wax*; and towards the end of the operation strong acid vapours arise, and also a quantity of oil, which becomes solid on cooling, and is called *butter of wax*.

WHIN-STONE. A species of trap. *See* TRAP.

WODANIUM. A metal lately discovered in a mineral called *wooden pyrites*. It is as hard as fluor spar, of a bronze yellow colour, and has a specific gravity of 11.470. It is malleable, soluble in nitric acid, and when heated in atmospheric air it is converted into a black oxide. It is precipitated from its solution by alkalies and alkaline carbonates, as also by zinc, which throws it down in the metallic state.

Hydrocyanate of potass produces a light-grey precipitate when added to the solution of wodanium, but tincture of galls has no effect on it.

Wolfram. An ore of tungsten, consisting of tungstic acid, oxide of manganese, and oxide of iron. *See* TUNGSTEN, ORES OF.

X.

XYLOCRATES. A name formerly given to those salts now called ACETATES.

Y.

YTTRIA, or ITTRIA. A very rare earth, found in Sweden, and consisting of a metallic base, called yttrium, and oxygen. It is white, smooth to the touch, tasteless, insoluble, and has never yet been fused. It is dissolved by most of the acids, and is again separated from them by the addition of potass, soda, lime, or barytes. Yttria has a spe-

cific gravity of 4.842, being the heaviest earth known, and it is obtained from the minerals called *gadolinite* and *yttrotantalite.* It is soluble in a solution of carbonate of ammonia, and when combined with acids it forms coloured salts, which have a sweet taste.

YTTRIUM. The supposed metallic base of yttria.

Yttrotantalite. A Swedish mineral, from which the earth called yttria is obtained. It is of a dark colour, has a shining metallic lustre, and is generally found in a vein of felspar, accompanied by gadolinite; it occurs disseminated in small masses, and consists of columbic acid 45, and yttria and oxide of iron 55; it may, therefore, be called a ferruginous columbate of yttria.

Z.

ZAFFRE. A blue pigment, consisting of glass coloured by oxide of cobalt. *See* COBALT, OXIDES OF.

ZIMOME. A vegetable substance, obtained from the gluten of wheat, by repeatedly digesting it in alcohol until no more gliadine (its other component part) can be extracted from it; what remains undissolved is zimome; if exposed to air, it becomes brown, and putrifies; it forms a kind of soap with potass, and by its decomposition, nitrogen, oxygen, hydrogen, and carbon, are obtained.

Zimome may be procured from other vegetables besides wheat.

ZINC. formerly called *Speltre.*—Zinc is a very useful metal, of a bluish-white colour and crystalline texture; it is somewhat malleable at common temperatures, and at a heat of about 300°, it may be easily reduced to thin plates, but, if heated to 400°, it becomes so brittle, that it may be reduced to powder. Its specific gravity varies from 6.861 to 7.190, the lightest being generally the purest; it is soluble in almost all acids, and if they are moderately diluted, it produces hydrogen gas; it decomposes water at all temperatures, and may be procured in a pure state by the following process. The zinc to be purified is granulated by pouring it while melted into water; it is then digested in diluted sulphuric acid until no more hydrogen gas is disengaged. A polished plate of the same metal is now digested in the solution, which is afterwards filtered, and decomposed by carbonate of potass. The insoluble carbonate of zinc obtained is mixed with charcoal powder put into an earthenware retort, and heated to whiteness, when, if the beak of the retort be immersed in water, pure zinc will be collected in its neck.

Zinc melts at 680°, at a still stronger heat it evaporates, and, if in contact with air, it burns into a white oxide. It has a stronger affinity for oxygen than any other common metal, and hence it precipitates metals from their solutions in acids. It combines with chlorine, iodine, sulphur, phos-

phorus, &c., and its alloys with other metals are much used in the arts.

If zinc filings be mixed with chlorate of potass, and struck upon an anvil, a violent detonation takes place, and the salt is decomposed.

ZINC, AMALGAM OF. A compound of mercury and zinc, used for exciting electrical machines. It is formed by mixing one part of melted zinc with six of hot mercury.

Zinc, Butter of. A name formerly given to the chloride of zinc, because it is easily fused. *See* ZINC, CHLORIDE OF.

ZINC, CARBONATE OF. An insoluble compound of oxide of zinc and carbonic acid, containing about 54 per cent. of the metal. It occurs in chemical analysis, and is easily obtained by pouring a solution of carbonate of potass into another of sulphate of zinc. It is white and pulverulent when pure, but there is a native carbonate of zinc, commonly called *calamine,* which is of a yellowish brown colour, and contains some oxide of iron.

ZINC, CHLORIDE; formerly called *Muriate of Zinc, Butter of Zinc.*—Chloride of zinc is a soluble and semitransparent compound, obtained by burning the metal in chlorine gas. It is easily fused, and by the action of water upon it, a hydrochlorate of zinc is formed. Chloride of zinc is also formed by evaporating the hydrochlorate in close vessels.

Zinc, Diaphoretic. *Zinc, Flowers of.* Names given to the OXIDE OF ZINC.

ZINC, HYDRIODATE OF. A compound of oxide of zinc and hydriodic acid. It is formed by digesting iodine and water with metallic zinc until the solution becomes colourless; it is very useful as a test for the oxides of some metals when dissolved in acids, as it precipitates them of the following colours.

Mercury	Proto-salts	*Greenish yellow.*
	Per-salts	*Red.*
Lead		*Lemon colour.*
Antimony		*Orange or rhubarb colour.*
Bismuth		*Brown or grey.*
Nickel		*Light brown.*
Platinum .		*The colour of the solution is changed to a very deep brownish red.*
Copper . .		*The solution becomes of a yellowish green colour, and sometimes a green precipitate is formed.*
Silver . .		*A white precipitate is formed, often having a yellow tinge, in consequence of impurities.*

In using the hydriodate of zinc as a test, the metallic solution should not be very acidulous, and it should be remembered, that arsenic, tin, manganese, and iron, are not precipitated by it.

Zinc, Muriate of. *See* ZINC, CHLORIDE OF.

ZINC, ORES OF. The ores of zinc are not numerous, but abundant. *The sulphate and the*

oxide are seldom met with, but the carbonate and the sulphuret are found in large quantities. *The carbonate* is generally of a brownish colour, massive, or crystallized; it is commonly called *calamine*, and when put into an acid it is dissolved with effervescence. *The sulphuret* has a resinous lustre, occurs crystallized, and is commonly called *blend*, or *black jack*. The metal is usually obtained by roasting the ores, and distilling them with powdered charcoal; the process is performed by means of large earthen jars, into which the washed ore, mixed with $\frac{1}{3}$th of its weight of charcoal, is put. The jars have iron tubes passing entirely through the mixture from the bottom to the top, and the lower ends of these tubes are immersed in water beneath the furnace. By this means, when the jars are covered, and the mixture being raised to a bright red heat, the vapour of zinc rises to the top, and passes down (through the iron tubes) into the water beneath, where it is condensed. *For the analysis of ores of zinc, see Note* 18.

ZINC, OXIDE OF; formerly called *Nihilum Album, Philosophical Wool, Pompholyx, Magistery of Zinc, and Cadmia Fornacum.*—We know but one oxide of zinc, which consists of zinc 81, and oxygen 19. It is insoluble in water, but soluble in acids and alkalies; it is used in medicine, and is obtained by pouring pure ammonia into a solution of the sulphate of zinc, or by calcining

the carbonate. It is white, and is sometimes used as a pigment, but it is of no use in the laboratory, except for the formation of the other salts of zinc.

An impure oxide of zinc is found native.

ZINC, SULPHATE OF; formerly called *White Copperas and White Vitriol.*—This is a very soluble and crystallizable salt, obtained by dissolving zinc in diluted sulphuric acid. It is white, and its crystals (which contain a large quantity of water) are efflorescent when exposed to a dry atmosphere. It is used by painters, as well as in medicine, and, although it possesses no very striking properties, it should always be kept in a laboratory for the sake of the oxide of zinc which it contains. Most of the sulphate of zinc used in the arts is prepared by exposing the native sulphuret (*blend*) to air and water, in the same manner as iron-pyrites is exposed in the manufacture of protosulphate of iron.

ZINC, SULPHURET OF. This substance (which is found native) was formerly supposed to be a compound of oxide of zinc with sulphur, but it is now known to contain the zinc in the metallic state, although the compound has not a metallic lustre. Sulphuret of zinc may be formed artificially by melting sulphur with oxide of zinc, and in this operation one part of the sulphur carries off the oxygen, while the other combines with the metal. The native sulphuret is called *blend*, or *black Jack*; it occurs massive and crystallized, is of a dark yellowish brown colour, and contains

iron. Sometimes it becomes phosphorescent by friction.

ZIRCONIA. Zirconia is a white earth, consisting of zirconium and oxygen. It is found in a mineral called *jargoon*, in the island of Ceylon, as also in the *hyacinth* and *zirconite*. It has a specific gravity of about 4.500, fuses at a very strong heat, will scratch glass, and is soluble in acids, but insoluble in water.

Pure zirconia may be procured from the minerals which contain it, by the following process:—

Fuse the powdered mineral for half an hour with twice its weight of potass, wash the whole with water, and let the part which is insoluble in the water be dissolved in hydrochloric acid; if liquid ammonia be now added to this solution, a precipitate is formed, which should be washed first with a boiling solution of oxalic acid, and then with water. It is now exposed to a strong heat in a platinum crucible, after which it is fused with potass, dissolved in hydrochloric acid, and reprecipitated by the addition of ammonia.

ZIRCONIUM. The metallic base of the earth called zirconia, which is an oxide of zirconium.

ZUNDERERZ. An ore of silver, sometimes called tinder ore.

A TABLE

OF

CONTENTS OF THE NOTES.

The Analysis of Iron Ores . . . . . *Note* 1
The Reduction of Metallic Oxides, Fluxes, &c. . . 2
Cupellation, and the Formation of Cupels 3
The Analysis of Copper Ores 4
Tables of Chemical Elective Attraction 5
A Table of Simple Bodies with their equivalent numbers affixed, taking Hydrogen as unity 6
A Table of the Solubility and Form of the Crystals of the most important Salts 7
The Analysis of Silver Ores 8
The Analysis of Tin Ores 9
The Analysis of Ores of Manganese 10
A Table of the principal Chemical Tests, &c. 11
A Table of the Solubility of Salts in Alcohol . . . 12
Analysis of Galena 13
A Method of obtaining all the scarce Metals from the Ore of Platinum 14
Method of separating Yttria and Glucina from other Earths 15

CONTENTS OF THE NOTES.

Method of using the Phosphate of Soda as a precipitant for Magnesia . . . . . *Note* 16
Enamels and Glass Pastes 17
The Analysis of Zinc Ores 18
On the Ores of Titanium, their Analysis, &c. 19
On the Compounds of Sulphur with Oxide of Antimony, Kermes Mineral, Liver of Antimony, &c. . 20
On the Ores of Antimony 21

NOTES.

NOTE 1.

The Analysis of Iron Ores.

1st. A HUNDRED and fifty grains of *iron pyrites* in fine powder were dissolved (by the assistance of heat,) in a little moderately concentrated nitric acid; the solution took place with great effervescence, and much nitrous gas was evolved, one part of the acid being decomposed, by converting the sulphur of the pyrites into sulphuric acid, and the other by oxydating the iron. The product of this operation was a solution of the per-sulphate of iron.

2nd. The solution being diluted with distilled water, pure potass was added to it as long as it caused a precipitate, which precipitate, (peroxide of iron,) when separated by a filter, washed, and dried, was found to weigh 130 grains, which indicate 90 grains of iron.

3rd. The clear solution which had passed the filter was decomposed by nitrate of barytes, to separate the sulphuric acid which had been formed by the acidification of the sulphur; and the precipitate of sulphate of barytes, when washed and dried, weighed 290 grains, which contain about 59 grains and a half of sulphur.

Thus it will appear by this analysis, that 150 grains of the pyrites contain:

Iron,	operation 2nd . .	90 grains.
Sulphur,	——— 3rd . .	59½
		149½
	Loss	½
	In all	150

Analysis of Iron Stone.

1st. *Iron stone,* consisting of oxide of iron, silica, and alumina, may be analysed by heating the powdered ore with twice its weight of pure potass in a silver crucible; when it has been kept in a state of fusion for about half an hour, digest it in boiling water: by these means the silica and alumina are dissolved, while the oxide of iron remains.

2nd. The clear liquor is to be mixed with rather more sulphuric acid than is necessary for its saturation, when the silica is precipitated, and may be washed and dried at a red heat.

3rd. The liquor still contains the alumina, in the form of a sulphate, and the earth may be precipitated by the addition of carbonate of soda, and when washed and dried at a red heat it may be considered as pure.

N. B. In all analyses, if the precipitates are dried at a red heat, the sample of ore should also be heated to redness before the analysis is commenced, as it may contain water.

A very good flux for reducing the ores of iron to the metallic state, is formed by mixing 1 part of charcoal with 2 of chalk, and 4 of pure powdered glass; it is superior to the common black flux, because it is more fixed in the fire.

NOTE 2.

On the Reduction of Metallic Oxides, Fluxes, &c.

In reducing the oxide of a metal (except that of manganese,) to the metallic state, it is often useful (the oxide being previously mixed with some reducing substance, and put into a crucible,) to cover it with a layer of common salt, to the depth of an inch at least, for the following reasons. 1st. If the oxide is not fusible, it can never be so accurately blended with the carbonaceous matter as that every particle of it may be decomposed. 2nd. Whether fusible or infusible, and even supposing the whole to be decomposed, there must always be some carbon remaining, in which the globules of melted metal are entangled, instead of running all into one mass at the bottom of the crucible. Now the salt in the first place prevents the carbon from burning, except by virtue of the oxygen contained in the oxide; in the second place, it forms a medium in which the carbon and the oxide blend more intimately together; and thirdly, when the metal is reduced, instead of being clogged up, as a great part of it usually is, (the carbon being lighter and the metal heavier than the melted salt), the metal sinks to the bottom, and forms into one mass, while the carbon floats on the top.

In assaying ores which contain sulphur or arsenic, they should first be calcined for some time, to separate as much of these substances as possible, after which they should be mixed with an equal weight of black flux, and exposed to a greater or less heat, according to the fusibility of the metal.

There are several sorts of fluxes which may be used in

the reduction of metallic ores and oxides; a mixture of 16 parts of powdered glass, 2 of dried subborate of soda, and 1 of charcoal powder, may be used with advantage in working with metals of difficult fusion; but for the reduction of oxides easily fused, as the oxide of antimony, lead, or bismuth, a good cheap flux may be formed by pounding 2 parts of common salt with 1 of charcoal. Equal weights of the flux and oxide should be used.

Hitherto we may always use a crucible, and that even uncovered; but when reducing the oxides of zinc or arsenic, we must be much more careful not to let any thing evaporate, as these metals are of a very volatile nature. Generally an earthenware retort with a wide neck is used for reducing these oxides, and the pure metal sublimes; in this case it is only necessary to mix the oxide with one-third of its weight of charcoal powder, and the neck of the retort should dip about half an inch into a basin of water, which will help to condense the vapour.

Arsenic requires but a low red heat for its sublimation, but with the oxide of zinc the heat should be kept up at the highest degree possible, until no more of the metal seems to sublime. For subliming arsenic, a green glass retort, set in a crucible full of sand, will be found very convenient.

NOTE 3.

On Cupellation, and the Formation of Cupels.

Cupels are small saucers of a particular form; they are made of paste, formed of bones calcined to whiteness, and mixed with water, and sometimes a little white of egg. This paste is moulded into a proper form by means of a

polished brass ring, made somewhat smaller at one end than the other; the cupels when formed are sprinkled over with powdered bone-ash, and dried gently. They vary in size from about two to three inches in diameter, and are employed in the purification of gold and silver by means of lead.

The silver or gold to be cupelled is mixed with more or less lead, according to the quantity of copper or other base metals which it may contain. Thus, 1 part of copper, &c. alloyed with

30 parts of silver or gold require	128 parts of lead.
15	96
7	64
4	56
3	40
1	30
$\frac{1}{3}$	20
$\frac{1}{15}$	17

The mixture of the silver or gold with the proper quantity of lead, is put into a cupel in the muffle of a reverberatory furnace, and the fire should be raised so as to make the whole of a bright red heat. This degree of heat is to be continued until a white fume is visible over the melted metal; and at this period it may be a little decreased, but not much. After a certain time, according to the quantity of metal which is used, all the lead, together with the impurities of the silver or gold, become vitrified, and sink into the cupel, while the pure metal remains.

The weight of the cupel used should be at least half that of the lead which is mixed with the silver.

Fig. 5, *plate* 1, represents a section of a cupel.

NOTE 4.

The Analysis of Copper Ores.

1st. A HUNDRED grains of grey copper ore, containing iron, copper, silica, &c., were boiled in nitric acid until nothing more could be dissolved, a quantity of carbonic acid was disengaged by the decomposition of some carbonate of copper, and the insoluble residuum, which was found to be silicious stony matter, weighed 14 grains.

2nd. The clear solution was next supersaturated with ammonia, by which means the iron was precipitated in the form of a peroxide, while the oxide of copper was re-dissolved by the excess of ammonia, the precipitate weighed 30 grains, which indicate 21 of pure iron.

3rd. Nitric acid was now poured into the solution, so as entirely to saturate all the ammonia in it, and to convert the oxide of copper into a nitrate, when, upon the addition of carbonate of potass, an abundant precipitate of carbonate of copper fell, which on being reduced to the state of a peroxide, by a dull red heat, weighed 64 grains, thus indicating 51 grains of pure copper.

Hence 100 grains of this ore contain:

Silicious matrix,	operation 1st	14 grains.
Iron	2nd	21
Copper	3rd	51
Carbonic acid, oxygen, loss, &c.		14
	In all	100

Sulphate of copper may be analysed as follows:

1st. Dissolve the cupreous salt in pure water, and immerse into the solution a plate of clean polished iron, by which means the whole of the copper will be precipitated

in the metallic state, and may be washed, dried, and weighed, when every 80 parts of it indicate a 100 of peroxide of copper contained in the sulphate.

2nd. The sulphuric acid still remains in solution, and may be precipitated by the addition of nitrate of barytes, when every 100 grains of the precipitate will contain 34 of the acid. If the analysis be well performed, the deficiency of weight will indicate the quantity of water which the sulphate of copper contained.

NOTE 5.

Tables of Chemical Elective Attraction.

In the following table, the power with which two bodies combine, or remain combined with each other, is denoted by numbers; thus, sulphuric acid combines with barytes by a power equal to 1,000, while the attractive power of nitric acid for the same earth is only 849.

Names of the Acids.	*Barytes.*	*Strontia.*	*Potass.*	*Soda.*	*Lime.*	*Magnesia.*	*Ammonia.*	*Glucina.*	*Alumina.*	*Zircon ia.*
Sulphuric Acid	1000	903	894	885	868	810	808	718	709	700
Nitric . . .	849	754	812	804	741	732	731	642	634	626
Hydrochloric .	840	748	804	797	736	728	729	639	632	625
Phosphoric .	906	827	801	795	865	736	728	648	642	636
Suberic . .	800	?	745	740	735	700	720	535	530	525
Hydrofluoric .	706	703	671	666	734	620	613	534	529	524
Oxalic . . .	950	825	650	645	960	820	611	600	594	588
Tartaric . .	760	757	616	611	867	618	609	520	515	510
Arsenic . .	733½	733¼	614	609	733¾	733	607	580	575	570
Succinic . .	930	?	612	607	866	732¼	605	510	505	500
Citric . . .	730	618	610	605	731	615	603	415	410	405
Lactic . . .	729	603	609	604	732	575	601	410	405	400
Benzoic . .	597	?	608	603	590	570	599	400	395	390
Sulphurous .	592	527	488	484	516	439	433	355	351	347
Acetic . . .	594	480	486	482	470	?	432	395	391	387
Mucic . . .	900	?	484	480	860	732½	431	425	420	415
Boracic . .	515	513	482	479	537	459	430	388	385	382
Nitrous . .	450	430	440	437	425	410	400	340	338	332
Carbonic . .	420	419	306	304	423	366	339	325	323	321
Hydrocyanic .	400	?	300	298	290	280	270	260	258	256

In the following table any substance in any of the columns is known to have a greater affinity for that at the head of the column, according as it is placed nearer to it; thus, in the column with *oxygen* at its head, zinc is placed highest, because its affinity for oxygen is superior to that of any other metal mentioned.

Water.
Potass.
Soda.
Ammonia.
Deliquescent Salts.
Alcohol.
Carbonate of Ammonia.
Ether.
Sulphuric Acid.
Non-deliquescent Salts.

Sulphuretted Hydrogen.
Barytes.
Potass.
Soda.
Lime.
Ammonia.
Magnesia.
Zirconia.

Fixed Oils.
Barytes.
Strontia.
Lime.
Ether.
Volatile Oils.
Fixed Alkalies.
Ammonia.
Sulphur.
Phosphorus.

Volatile Oils.
Ether.
Alcohol.
Fixed Oils.
Alkalies.
Sulphur.
Phosphorus.

Alcohol.
Water.
Ether.
Volatile Oils.
Ammonia.
Fixed Alkalies.
Sulphur.
Phosphoric Acid.

Ether.
Alcohol.
Volatile Oils.
Water.
Sulphur.

Sulphur, in the Humid Way.
Oxygen.
Molybdic Acid.
Oxide of Lead.
——— Tin.
——— Silver.
——— Mercury.
——— Arsenic.
——— Antimony.
——— Iron.
Potass.
Soda.
Barytes.
Strontia.
Lime.
Magnesia.
Phosphorus.
Fixed Oils.
Ammonia.
Ether.
Hydrogen.

Sulphur, in the Dry Way.
Oxygen.
Potass.
Soda.
Iron.
Copper.
Tin.
Lead.
Silver.
Cobalt.
Nickel.
Bismuth.
Antimony.
Mercury.
Arsenic.
Uranium.
Molybdenum.
Tellurium.

Oxygen.
Hydrogen.
Carbon.
Boron.
Phosphorus.
Sulphur.
Nitrogen.
Chlorine.

Oxygen with Metals.
Zinc.
Iron.
Tin.
Antimony.
Arsenic.
Lead.
Bismuth.
Copper.

NOTE 6.

A Table of Simple Bodies, with their equivalent Numbers affixed, taking Hydrogen as unity.

Metals placed according to their Saturating Powers.

Silicum	8	Saturate 8 of oxygen.
Lithium	10	
Magnesium	12	
Aluminum	18	
Glucinum	18	
Calcium	20	
Sodium	24	
Iron	28	
Manganese	28	
Chromium	28	
Nickel	30	
Cobalt	30	
Yttrium	32	
Zinc	35	
Zirconium	37	
Arsenic	38	
Tellurium	38	
Potassium	40	
Selenium?	41	
Antimony	45	
Cerium	46	
Strontium	47	
Molybdenum	48	
Cadmium	56	
Tin	59	
Copper	64	
Barium	70	
Bismuth	71	
Platinum	96	
Tungsten	96	
Lead	104	
Silver	110	
Rhodium	120	
Mercury	200	
Gold	200	

Palladium, Columbium, Osmium, Iridium, Uranium, Titanium, Wodanium, Thorinum — The equivalent numbers, or in other words, the saturating powers of these metals are not exactly known.

Imponderable Simple Bodies.

Electricity.
Magnetism.
Light.
Caloric.

Simple unmetallic Bodies forming Acids with Oxygen, but not with Hydrogen.

Nitrogen	14	Saturate 8 of oxygen.
Carbon	6	
Phosphorus	12	
Sulphur	16	Saturate 16 of oxygen.
Boron	6	

Simple Bodies forming Acids when combined with Hydrogen.

Chlorine	36	Saturate 1 of hydrogen.
Iodine	125	
Fluorine	16	

Acidifying Principles.

Oxygen	8	Saturate 1 of hydrogen.
Hydrogen	1	Saturates 8 of oxygen.

NOTE 7.

A Table of the Solubility and Form of the Crystals of the most important Salts.

Salts.	*Form of their Crystals.*	*Solubility in* 100 *Parts of Water at* 60°.	*Solubility in* 100 *Parts of Boiling Water.*
Sulphate of Potass	Six-sided prisms	6 parts	20 parts.
Bisulphate of Potass	Six-sided prisms	50 ——	100 ——
Sulphate of Soda	Grooved six-sided prisms	37 ——	125 ——
—— Ammonia	Six-sided prisms	50 ——	100 ——
—— Magnesia	Four-sided prisms	100 ——	133 ——
—— Aluminá and potass (*alumn*)	Octahedrons	5 ——	133 ——
—— Lime	Quadrangular prisms	Requires 350 times its weight of water to dissolve it.	
—— Zinc	Four-sided prisms	40 parts.	
Protosulphate of Iron	Rhomboidal prisms	50 ——	

Salts.	*Form of their Crystals.*	*Solubility in* 100 *Parts of Water at* 60°.	*Solubility in* 100 *Parts of Boiling Water.*
Nitrate of Barytes	Octahedrons	9 parts	30 parts.
——— Potass	Various	14 ——	200 ——
——— Strontia	Octahedrons	100 ——	200 ——
——— Ammonia	Various	50 ——	200 ——
——— Silver	Four or six-sided tables	100 ——	
——— Lead	Tetrahedrons		13 ——
Chloride of Barium	Tables and octagons	18 ——	20 ——
——— Sodium	Cubes	33 ——	33 ——
——— Calcium	Prisms	200 ——	Soluble in its own water of crystallization.
Chlorate of Potass	Thin plates	6 ——	40 parts.
Phosphate of Soda	Various	25 ——	50 ——
——— Potass	*Uncrystallizable*	Very soluble	Very soluble.
Carbonate of Potass	*Uncrystallizable*	Very soluble	Very soluble.
——— Soda	Irregular	Very soluble	Very soluble.
——— Ammonia	Irregular	30 parts	100 parts.
Bicarbonate of Potass	Square prisms	25 ——	80 ——
——— Soda	Octahedrons	50 ——	100 ——

NOTES.

NOTE 8.

The Analysis of Silver Ores.

THE ore, consisting entirely of mercury and silver, may be easily analysed in the dry or humid way. In the dry way 100 parts of it are put into a glass tube hermetically sealed at one end, and the tube is immersed in a crucible full of sand, which is afterwards exposed to a red heat. By this means the mercury is volatilized, and condenses on the sides of the tube, while the silver remains at the bottom, and the two substances may be collected and weighed separately by cutting the tube in half.

Supposing an ore to consist of silver, mercury, and lead, it may be analysed in the following manner:

1st. 100 grains of it are exposed to heat in a glass tube, by which means the mercury is sublimed, collected, and weighed, while the two other metals remain fixed.

2nd. The residuum in the tube is digested in a mixture of two parts of hydrochloric (*muriatic*) acid, and one of nitric acid, until nothing but a white powder remains undissolved. The whole is largely diluted with boiling water, and the white powder, which consists of chloride of silver, is collected, dried, and estimated according to its weight.

3rd. The clear liquid which has passed the filter, contains the lead in the state of a hydrochlorate (*muriate*). Sulphate of soda is added to it, and the sulphate of lead, which precipitates, when washed and dried, enables the operator to calculate the proportion of lead contained in the ore.

NOTE 9.

The Analysis of Tin Ores.

THE native oxide of tin, containing iron, may be analysed by digesting 100 grains of it, reduced to fine powder, in a solution of pure potass; heat is applied, and the digestion is continued until nothing but oxide of iron remains. This oxide is separated and estimated, after which the peroxide of tin may be precipitated from the alkaline solution by dropping in hydrochloric acid, until no further precipitate is formed; care must be taken not to add the acid in excess, as in that case the oxide of tin would be redissolved.

To reduce the oxide of tin to the metallic state in the dry way is easy, if proper means be employed; but a small portion of the metal is always lost in consequence of its volatile nature, and great affinity for oxygen. The oxide, whether native or artificial, should be in fine powder, it is put into a good crucible, lined with charcoal, and being covered with a stopper of the same material, another cover is luted on, and the whole is exposed to a red heat for about a quarter of an hour, at the end of which time a button of pure tin will be found in the bottom of the crucible, and by weighing it, its proportion to the quantity of ore used will be ascertained.

NOTE 10.

The Analysis of Ores of Manganese.

THE native oxide of manganese, containing silica and iron, may be analysed as follows:

1st. 100 parts of the ore, free from water, are digested

in hydrochloric acid, until nothing more can be dissolved, and that which remains, being silica, it is washed, dried, and weighed.

2nd. The clear solution is mixed with liquid ammonia, which should not be added in excess, and by this means the peroxide of iron is precipitated, while a protoxide of manganese remains in solution.

3rd. The solution, containing the manganese, is evaporated to dryness or heated to redness in an open vessel, when a pure deutoxide is obtained, which enables the operator to calculate the quantity of peroxide contained in the ore.

Native phosphate of manganese, containing iron, may be analysed with ease; it is of a brownish black colour, and is hard enough to scratch glass.

1st. Boil 100 grains of the powdered phosphate of manganese, with an equal weight of pure potass, in two ounces of water, and when the whole of the phosphate is decomposed, separate the clear liquor by a filter, and wash the insoluble matter with pure water.

2nd. Add to the clear liquid exactly enough nitric acid to saturate any free alkali which it may contain, and after this pour a solution of nitrate of barytes, to precipitate the phosphoric acid; dry the precipitate, and estimate it as containing 27½ per cent. of the acid.

3rd. Let the powder, which was insoluble in the alkali, (*operation* 1*st*,) be dissolved in hydrochloric acid, and add ammonia to the solution as long as a precipitate of oxide of iron takes place; collect, wash, dry, and weigh the precipitate.

4th. Evaporate the remaining liquor to dryness with a few drops of nitric acid, and boil the residuum in water, when the peroxide of manganese will remain at the bottom in the form of a black powder.

NOTE 11.

A Table of the principal Chemical Tests, together with the appearances which they produce with different substances, and the per centage of any substance, which is indicated by the Precipitate formed.

List of Tests.	*What Tests for.*	*Appearance or Precipitate produced, and Estimation of Precipitates.*
Tincture of Red cabbage	A test for uncombined acids or alkalies . . .	By alkalies it is changed to green, and by acids to red.
——— Litmus	——— uncombined acids	Is changed to red.
——— Turmeric	——— uncombined alkalies	——— to a brownish red.
——— Brazil wood	——— Ditto Ditto	——— to a violet colour.
——— Galls	——— metals	*See* GALLS, TINCTURE OF.
Solution of Barytes	——— free carbonic acids	Produces a carbonate of barytes, containing 22 *per cent.* of carbonic acid.
	——— Sulphuric acid .	Produces a sulphate of barytes, containing 34 *per cent.* of sulphuric acid.
——— Lime	——— Carbonic acid .	Produces a carbonate of lime, containing 40 *per cent.* of carbonic acid.
——— Soap	——— Uncombined acids	Produces a white precipitate.
——— Tannin	——— Gelatine . . .	——— Brownish yellow precipitate.

List of Tests.	*What Tests for.*	*Appearance or Precipitate produced, and Estimation of Precipitates.*
Solution of Starch	A test for Iodine	Produces a blue precipitate.
—— Iodine	—— Starch	—— Ditto.
—— Sulphuretted hydrogen	—— Metals	*See* HYDROGEN, SULPHURETTED.
—— Ammonia	—— Copper	Produces an azure blue colour.
	—— Magnesia and alumina	Produces a white precipitate of the earth.
—— Tartaric acid	—— Potass	—— Salt of sparing solubility.
	—— Soda	—— a very soluble salt.
—— Oxalic acid	—— Lime	—— an oxalate of lime containing 44 *per cent.* of lime.
—— Arsenous acid	—— Sulphuretted hydrogen	—— a yellow precipitate.
—— Sulphuric acid	—— Lead	—— a sulphate of lead, containing 68 *per cent.* of lead.
	—— Barytes	—— a sulphate of barytes, containing 66 *per cent.* of barytes.
	—— Strontia	—— a sulphate of strontia, containing 60 *per cent.* of strontia.
—— Hydrochloric acid	—— Silver	—— a chloride of silver, containing 75 *per cent.* of silver.

NOTES.

List of Tests.	*What Tests for.*	*Appearance or Precipitate produced, and Estimation of Precipitates.*
Solution of Protonitrate of mercury	A test for Hydrochloric acid	Produces a chloride of mercury.
——— Nitrate of cobalt . .	——— Alumina . . .	For the manner of using this test, *see* COBALT, NITRATE OF.
——— Barytes	——— Sulphuric acid .	Produces a sulphate of barytes, containing 34 *per cent.* of acid.
——— Silver	——— Hydrochloric acid	——— a chloride of silver, indicating 26 *per cent.* of acid.
——— Lead	——— Sulphuric acid .	——— a sulphate of lead, containing 29 *per cent.* of acid.
	——— Arsenic acid . .	——— an arseniate of lead, containing 32 *per cent.* of acid.
——— Acetate of barytes . .	——— Sulphuric acid .	——— a sulphate of barytes, containing 34 *per cent.* of acid.
——— Silver . . .	——— Hydrochloric acid	——— a chloride of silver, indicating 26 *per cent* of acid.
——— Subacetate of lead . .	——— Sulphuretted hydrogen	——— a black precipitate.
	——— Extractive matter	——— a brownish precipitate.
	——— Mucus	——— Ditto Ditto.

NOTES.

List of Tests.	*What Tests for.*	*Appearance or Precipitate produced, with Estimation of Precipitates.*
Solution of Sulphate of silver . .	A test for Hydrochloric acid	Produces a chloride of silver, indicating 26 *per cent.* of acid.
——— Copper .	——— Soluble arseniates .	——— a bluish green arseniate of copper.
	——— Ammonia . . .	——— a blue colour.
——— Soda . .	——— Lead	——— a sulphate of lead, containing 68 *per cent.* of lead.
——— Protosulphate of iron .	——— Uncombined oxygen	——— a reddish colour.
——— Ammonio-Sulphate of copper	——— Arsenic acid . .	——— a bluish green arseniate of copper.
——— Oxalate of ammonia .	——— Lime	——— an oxalate of lime, containing 44 *per cent.* of lime.
——— Phosphate of soda . .	——— Magnesia . . .	——— a phosphate of magnesia. *See* Note 16.
——— Succinate of ammonia	——— Iron	For the manner of using this test, *see* AMMONIA, SUCCINATE OF.
——— Carbonate of ammonia	——— Yttria and Glucina	Yttria and glucina are both soluble in a solution of carbonate of ammonia. *See* Note 15.
Hydrochlorate of barytes	——— Sulphuric acid .	Produces a sulphate of barytes, containing 34 *per cent.* of acid.
——— Gold	——— Protosalts of tin .	——— a purple precipitate of stannate of gold.

List of Tests.	*What Tests for.*	*Appearance or Precipitate produced, with Estimation of the Precipitates.*
Hydrochlorate of Platinum . . .	A test for Potass	Produces a yellow precipitate, with salts of potass, but none with salts of soda.
——— Ammonia . . .	——— Platinum . . .	——— a precipitate, which is reduced to the metallic state by a strong red heat.
——— Lime	——— Alkaline carbonates	——— a carbonate of lime.
	——— Oxalic acid . .	——— an oxalate of lime, containing 56 *per cent.* of acid.
——— Alumina . . .	——— Carbonate of Magnesia	——— a precipitate of carbonate of alumina.
Protohydrochlorate of tin . . .	——— Gold	——— a purple precipitate of stannate of gold.
Perhydrochlorate of mercury . . .	——— Albumen . . .	Produces a gelatinous precipitate.
Hydrocyanate of potass . . .	——— Metals	*See* HYDROCYANATES.
——— Ammonia . .		
——— Mercury . . .	——— Palladium . . .	Produces a cyanide of palladium, which deflagrates by heat.
Hydrosulphurets	——— Metals	*See* HYDROSULPHURETS.
Acetic acid	——— Resin and Gluten	The acetic acid dissolves resin and gluten, but when the solution is diluted with water, the former is precipitated, and the latter remains dissolved.

NOTE 12.

A Table of Solubility of Salts, &c. in 100 parts of Alcohol, at different temperatures.

Substances to be dissolved.	Quantity soluble in 100 parts of Alcohol.	Temperature of the Alcohol.	Colour of the flame when the solution is burnt.
Pure Sugar	24½	Boiling.	
Succinic Acid	74	Ditto.	
Boracic Acid	20	Ditto	Green.
Arsenous Acid	1¼	Ditto	Ditto.
Sulphate of Soda	nearly insoluble	Ditto	Red.
——— Ammonia	Ditto	Ditto	Ditto.
Nitrate of Cobalt	100	54½°	Ditto.
——— Copper	100	Ditto	Green.
——— Silver	41½	Boiling	Ditto.
——— Iron	2½	Ditto	Red.
——— Ammonia	89	Ditto	White and luminous.
——— Potass	2	Ditto	Yellow and very luminous.
——— Soda	9½	Ditto	Ditto.
——— Magnesia	290	Ditto	Ditto.
——— Lime	125	Ditto	Red and luminous.
——— Alumina	100	54½°	Ditto.
Chloride of Potassium	2	Boiling.	Yellow.
——— Aluminum	100	54½°	Ditto.
——— Calcium	100	Boiling	Red and luminous.
——— Magnesium	547	Ditto	Ditto.
——— Zinc	100	54½°	Ditto.
Perchloride of Iron	100	Boiling	White and sparkling.
——— Mercury	88½	Ditto	Yellow and luminous.
——— Copper	100	Ditto	Green and red.
Acetate of Lead	100	154½°	Ditto.
——— Copper	7½	Boiling	Green.
——— Soda	46½	Ditto	Ditto.
Hydrochlorate of Ammonia	7	Ditto	Ditto.
Binarseniate of Potass	3½	Ditto	Ditto.
Arseniate of Soda	1½	Ditto	Ditto.
Oxalate of Potass	3	Ditto	Ditto.
Tartrate of Potass	½	Ditto	Ditto.

Most other salts, as the carbonates of potass and soda, are insoluble in alcohol, and hence this fluid is often very useful for separating several salts from each other in an analysis.

NOTE 13.

Analysis of Galena, or Sulphuret of Lead.

THE following is one of the best methods of analysing a galena, containing lead, sulphur, arsenic, and iron.

1st. 100 grains of the ore in fine powder were digested for about a week in an excess of cold nitric acid diluted with an equal measure of water. The mixture was not heated, for fear of acidifying the sulphur and carrying the lead down in the state of a sulphate.

2nd. When no longer any of the ore was to be seen undecomposed, the solution was filtered, to separate from it the sulphur which was left undissolved, and a small portion of sulphate of lead which had been formed by the acidification of a part of the sulphur.

3rd. This powder being washed and dried at a heat of 212°, was found to weigh 18 grains. By the aid of a blowpipe it was burnt, and it left 4 grains of sulphate of lead, which contain $\frac{42}{100}$ths of a grain of sulphur, and this being added to the 14 grains burnt, shew the quantity of sulphur contained in the ore to be 14 grains and $\frac{42}{100}$ths.

4th. The washings of operation 3rd being added to the solution of process 2nd, sulphate of soda was added to precipitate the lead, and the white powder (*sulphate of lead,*) being separated, washed, and dried, weighed 86 grains, which, added to the 4 grains of process 3rd, make 90 grains, being equivalent to 61 grains and $\frac{64}{100}$ths of metallic lead contained in the ore.

5th. The clear liquid, which now contained arsenic acid and nitrate of iron, was saturated with liquid ammonia; a peroxide of iron was precipitated, which being washed and dried at a red heat, was found to be equivalent to 13 grains of pure iron.

6th. A solution of sulphate of copper was now added to the clear liquid, by which means arseniate of copper was precipitated, indicating 10 grains of arsenic.

Hence from this analysis a hundred grains of the ore contain:

		grains.	hundredths of grains.
Lead,	operation 4th	61	64
Sulphur	2nd and 3rd	14	42
Iron	5th	13	0
Arsenic	6th	10	0
		99	6
	Loss		94
	In all	100	0

NOTE 14.

A Method of obtaining all the scarce Metals contained in the Ore of Platinum.

THE ore of platinum, commonly called *platina*, occurs in the form of flat metallic grains, having a specific gravity of 17.7, and a hardness nearly as great as that of iron; besides platinum it sometimes contains palladium, rhodium, iridium, osmium, gold, iron, and lead, but our object being to obtain the platinum, and the four other scarce metals, we shall in the following process allow the gold, iron, and lead to be lost.

1st. Having exposed a quantity of the platinum ore to heat, in order to separate any thing volatile which it may contain, digest it in a mixture of nitric and hydrochloric acids as long as any thing can be dissolved from it, taking care to use a sufficient quantity of acid, and to assist the solution by the heat of a lamp. By this operation platinum, palladium, rhodium, gold, copper, and lead, are dissolved,

while the osmium and iridium remain in the form of a black insoluble powder.

2nd. Add hydrochlorate of ammonia to the solution as long as a precipitate takes place, and expose the precipitate to a long continued red heat, by which means pure platinum is obtained in a spongy form.

3rd. Add common salt to the remaining clear liquid; evaporate the whole to dryness, and digest the dry mass obtained in alcohol, by which means the palladium is dissolved, while the rhodium remains insoluble.

4th. Mix the alcoholic solution with hydrocyanate (*prussiate*) of mercury, when a cyanide of palladium will be precipitated, and may be reduced to the metallic state by the application of heat.

5th. Let the mass which was insoluble in alcohol be dissolved in water, and immerse a plate of zinc into the solution; by this means the rhodium, which was left undissolved by the alcohol (operation 3rd,) is precipitated in the state of an oxide, which is reduced to the metallic state by the application of an intense heat.

6th. That part of the ore which was insoluble in the acid, (operation 1st,) now remains to be decomposed; it consists of osmium and iridium, which metals may be separated from each other by distilling them with *nitre* in an earthenware retort, when the osmium will sublime in the form of an oxide, leaving the iridium with the nitre, from which it may be separated by boiling water, which will dissolve the saline particles, leaving the metal in the form of a black powder.

N. B. In the above process most of the gold, iron, and lead, have been left in the alcoholic solution of the 4th operation; but if any lead should be contained in the reduced rhodium of the 6th operation, it may be separated by nitric acid, which will not dissolve rhodium.

NOTE 15.

Method of separating Yttria or Glucina from other Earths.

YTTRIA or glucina may be separated from other earths by means of a solution of carbonate (sesquecarbonate) of ammonia, in which they both may be dissolved. They may afterwards be precipitated from the solution, thus formed, by the careful addition of an acid, taking care not to add more than is necessary to decompose the carbonate of ammonia.

NOTE 16.

Method of using the Phosphate of Soda as a precipitant for Magnesia.

MAGNESIA may be separated from any solution of its salts, in the form of an insoluble phosphate of ammonia and magnesia, by the following process:

1st. Having separated the other earths (if there were any,) from the solution, add to it a sufficient quantity of carbonate of ammonia to saturate the acid, which is combined with the magnesia. No precipitation will take place, but the magnesia will now exist (in the solution) in the state of a soluble carbonate.

2nd. Mix the solution of magnesia with a saturated solution of phosphate of soda until no further precipitate is formed; by this means a white insoluble compound of ammonia and magnesia with phosphoric acid is obtained. If this precipitate be well washed, dried, and calcined at a red heat, every 100 parts of it will be found to indicate the presence of 38.5 grains of magnesia, and hence it may be estimated accordingly.

NOTE 17.

Enamels, and Glass Pastes in imitation of Precious Stones.

Glass pastes and enamels consist chiefly of silica; the different colours which they have, depend upon the metallic oxides which they contain; in making them, they should be kept in a state of fusion in a Hessian crucible for twenty-four hours, as otherwise they will inclose a number of little air bubbles. The materials used should be very pure and clean, for if any combustible matter be present, it will infallibly render the paste coarse.

The following is a table shewing the colours which different metallic oxides impart to melted glass.

Oxides of manganese .	*red or violet.*
——— of cobalt . . .	*blue.*
——— of nickel . . .	*green.*
——— of antimony, bismuth, lead, and silver,	*yellow.*
——— of iron . . .	*green, black, red, or blue.*
——— of tin	*opake, milk white, or hyacinth.*
——— of copper . .	*green, blue, or brown.*
——— of gold . . .	*purple, or red.*

The glass, which forms the base of all the pastes, may consist of litharge or fused protoxide of lead 100 parts, white sand, or pounded quartz, 100, and carbonate of potass, 10.

Emerald paste is made of the glass above mentioned, 9216; acetate of copper, 72; peroxide of iron, 1.5.

Amethyst paste . . . glass, 9216; oxide of manganese, 20; oxide of cobalt, 1.

Ruby paste . . . . glass, 2880; oxide of manganese, 72.

Beryl paste	glass, 3456; protoxide of antimony, 24; oxide of cobalt, 1.5.
Carbuncle paste . . .	glass, 512; protoxide of antimony, 256; stannate of gold, 2; oxide of manganese, 2.

Enamels differ from glass pastes, in being generally opake, and containing a larger quantity of the metallic oxides.

White enamel .	is made of glass, 22; oxide of tin, 5; nitre, 1.
Yellow enamel	glass, 13; oxide of tin, 1; oxide of antimony, 1.
Orange-coloured enamel . .	glass, 40; persulphate of iron, 1; oxide of antimony, 41.
Red enamel	glass, 6; persulphate of iron, 2; carbonate of lead, 3.
Brown enamel	oxide of manganese, 9; deutoxide of lead, 34; powdered quartz, 16.

In making enamels, any of them may be rendered opake by the addition of oxide of tin; and if we wish to render them more fusible, a little borax should be added.

NOTE 18.

The Analysis of Zinc Ores.

CALAMINE, which either consists of carbonate or oxide of zinc containing oxide of iron, and silica, may be analysed in the following manner; the process depends upon the solubility of the oxide of zinc in ammonia.

1st. A certain quantity of the ore (previously deprived of water) is digested in dilute hydrochloric acid, until no further action takes place; by this means the oxides of zinc and iron are dissolved, while the silica remains behind, and may be dried and weighed.

2nd. The metallic solution is mixed with an excess of liquid ammonia, when the oxide of iron is precipitated, and may be collected; the oxide of zinc remains dissolved in the ammonia; it may be separated by evaporating the solution, and heating the residuum to redness, or by adding an acid to it until a precipitate has been formed and redissolved, and afterwards treating the solution with carbonate of ammonia, and heating the carbonate, which is precipitated, to redness.

N. B. If, in dissolving the ore, an effervescence takes place, and at the end of the analysis a deficiency is observed, this deficiency may be regarded as carbonic acid. Thus, if 100 grains of the ore were dissolved, and the silica and oxides of iron and zinc added together only make 70 grains; the remaining 30 are carbonic acid.

The analysis of *blend*, or native sulphuret of zinc, may be effected on the same principles as the above, but a mixture of nitric and hydrochloric acids is used as the solvent. It usually contains silica and iron, sometimes with a little arsenic and copper. A specimen of it was analysed by Dr. Thomson, and found to consist of zinc, 58.64; sulphur, 28.64; iron, 11.96; and silica, nearly pure, 0.76.

NOTE 19.

On the Ores of Titanium.

The ores of titanium all consist of the oxide of the metal combined with earths, iron, &c.

Rutile, or titanite, and octahedrite, are nearly pure oxides of titanium; the latter is of a brownish or bluish colour, while the former is always brown. They contain a small portion of oxide of iron, and occur in a crystalline form, having a splendent or glistening lustre.

Sphene is usually found in Scotland; it is of a reddish or yellowish brown colour, and by a strong heat it fuses into a sort of brown enamel. It has a specific gravity of about 3.5; occurs in the form of granular concretions, or crystallized, and it consists of oxide of titanium 46; silica 36, lime 16, water 1.

Iserine, although classed among the ores of titanium, consists chiefly of oxide of iron; it is hard, occurs in grains, and has a splendent or metallic lustre; its specific gravity is generally about 4.6, and some specimens contain oxide of uranium, while others consist entirely of the oxides of titanium and iron.

Menachanite much resembles iserine in form and colour, but its specific gravity is only 4.427, and besides some silica, it contains a large portion of oxide of manganese.

Nigrine consists of oxide of titanium, combined with 14 per cent. of oxide of iron, and 2 of oxide of manganese.

The Analysis of Sphene, or Rutilite, containing Oxide of Titanium, Silica, and Lime.

1st. Fuse 100 grains of the powdered mineral with 400 grains of pure potass, and digest the mixture in hydrochloric acid. The lime and oxide of titanium will be dis-

solved, while part of the silica may be separated from the solution by a filter.

2nd. A solution of carbonate of potass is poured into the clear liquid. The precipitate which forms is again digested in hydrochloric acid, when the rest of the silica remains undissolved; it is added to that previously obtained, and the whole is dried and weighed.

3rd. The solution, which still contains the lime, and oxide of titanium, is treated with ammonia, which precipitates all the latter, but has no effect on the lime.

4th. A boiling heat is applied to the remaining liquid, and at the same time a solution of carbonate of potass is added, which throws down all the lime in the state of a carbonate. This carbonate, when exposed to a strong red heat, becomes converted into pure lime.

The specimen of ore analysed by Klaproth was found to consist of silica, 35; oxide of titanium, 33; and lime, 33.

NOTE 20.

On the Compounds of Sulphur with Oxide of Antimony, Liver of Antimony, Crocus Metallorum, Kermes Mineral, and Golden Sulphur of Antimony.

Protoxide of antimony combines with sulphur in several proportions, and as the compounds formed are used as horse medicines, we shall give the methods that are made use of to obtain them.

If sulphuret of antimony *(crude antimony)* be detonated with an equal weight of nitre, or fused with half its weight of common *pearlash,* a brownish unmetallic compound is formed, consisting of sulphuretted protoxide of antimony, together with some sulphate and sulphuret of potass. This compound was formerly called *liver of antimony,* and *crocus*

metallorum by some of the old chemists, but others apply these names to it, only when it has been well edulcorated with water, by which means the sulphate and sulphuret of potass are carried off, and a sulphuretted protoxide of antimony (the *liver of antimony* now in use) remains.

Kermes Mineral is nearly the same thing as the liver of antimony, but it is supposed to differ from it in containing a sufficient quantity of hydrogen to constitute a hydroguretted sulphuret of the protoxide of antimony. The following is Mr. Clusel's process for obtaining it. Boil 1 part of powdered sulphuret of antimony with 22½ parts of crystallized carbonate of soda, and 200 parts by weight of water in an iron pot; filter the liquor, while hot, into warm vessels, and allow it to cool slowly, when at the end of twenty-four hours the kermes will be deposited in the form of a deep purple brown powder.

The golden sulphur of antimony is obtained from the clear liquid, out of which the kermes has been deposited, by adding to it dilute sulphuric nitric or hydrochloric acid; it is of a bright orange-colour, and differs from the kermes mineral only in containing about three times as much sulphur.

NOTE 21.

On the Ores of Antimony and their Analysis.

THE ores of antimony are not numerous, but generally rich in the metal; they are found in several parts of the world, but the native sulphuret is the only one which is ever worked in the large. These ores may be fused by means of the blowpipe, and when they contain the metal in the state of an oxide, they are reduced to the metallic state by heating them with charcoal.

Native antimony is found in the form of greyish, irregu-

lar shaped crystals; it has a brilliant metallic lustre, and has the properties of the antimony obtained by art, although it sometimes contains a small portion of silver, iron, and arsenic.

Grey antimony, or native sulphuret of antimony, has a metallic lustre, and is of a darker colour than the pure metal; it is often found in needle-like crystals, in which form it usually contains lead, whence it is called *plumbose antimony*.

Red antimony occurs in the form of small diverging crystals, which are very brittle, and have a reddish, bluish, or brownish colour; it consists of antimony, sulphur, and oxygen, and is often found accompanying grey antimony.

White antimony is a native oxide; it is of very rare occurrence, and is generally white, with a tinge of yellow, or grey. It crystallizes in small tender translucent crystals, which are rather heavy.

Antimonial ochre is another very rare mineral, occurring in Cornwall; it is of a yellowish brown colour, and has an earthy texture.

The analysis of antimonial compounds depends upon the property which water has of decomposing the salts of antimony; thus, an alloy of silver, lead, and antimony, may be analysed in the following manner:

1st. The alloy being divided into small pieces by means of filing, granulation, &c., digest it in a mixture of four parts of hydrochloric acid, and one of nitric acid, until nothing but a white powder remains, and then separate the white powder from the clear solution by means of a filter, and wash it with a small quantity of water acidulated with hydrochloric acid.

2nd. Throw the clear solution into a large quantity of pure water, and collect the white precipitate of oxide of antimony which immediately forms.

3rd. Add a solution of sulphate of soda to the dilute li-

quid separated from the antimony, and sulphate of lead will be precipitated. Now, having separated the sulphate of lead, add a little solution of potass, when a small quantity of oxide of antimony is obtained; it is to be added to that of the 2nd operation, and both may be dried, weighed, and estimated together.

4th. Let the white powder, of the 1st operation, which consists of the chlorides of silver and lead, be digested in a small quantity of moderately strong nitric acid; by this means the chloride of lead is dissolved, and it may be precipitated from its solution by sulphate of soda, when the precipitate being mixed with that of the 3rd operation, the quantity of lead may be estimated from the whole.

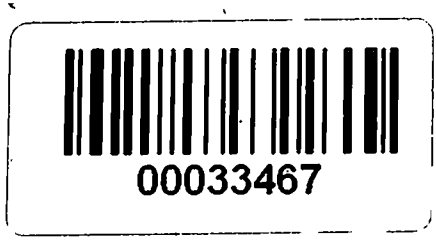
5th. The white powder, which could not be taken up by the nitric acid (4th operation), consists of chloride of silver; it should be washed with pure water, and it may either be estimated, or reduced to the metallic state by fusing it with twice its weight of carbonate of potass. The former method, however, is to be preferred, as in reducing the silver, although great care be taken, a considerable proportion of it is often lost.

ERRATUM.

Article, Acid mellitic, line 2, *for* melilite, *read* mellite.

FINIS.

J. M'Creery, Took's Court, Chancery Lane, London.


00033467

Digitized with financial assistance from the
Government of Maharashtra
on 02 January, 2016